

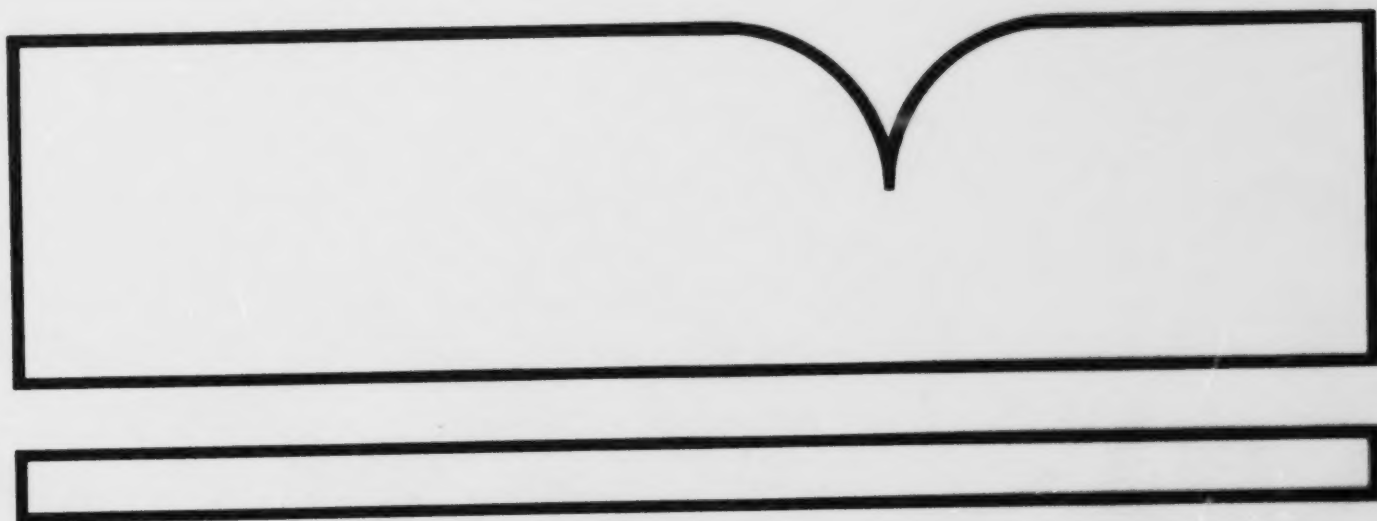
Trace Metals and Stationary Conventional
Combustion Processes: Volume 2. Bibliography

Radian Corp.
Austin, TX

Prepared for

Industrial Environmental Research Lab.
Research Triangle Park, NC

Aug 80



IERL-RTP-1079, -1080		TECHNICAL REPORT DATA (Please read instructions on the reverse before completing)	
1. REPORT NO. EPA-600/7-80-155b	2.	3. RECIPIENT'S ACCESSION NO. PB80 216179	
4. TITLE AND SUBTITLE Trace Metals and Stationary Conventional Combustion Processes; Vol. 1. Technical Report; Vol. 2. Bibliography		5. REPORT DATE August 1980 Issuing Date.	
		6. PERFORMING ORGANIZATION CODE	
7. AUTHOR(S) L.O. Edwards, C.A. Muela, R.E. Sawyer, C.M. Thompson, D.H. Williams, and R.D. Delleney		8. PERFORMING ORGANIZATION REPORT NO.	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Radian Corporation P.O. Box 9948 Austin, Texas 78703		10. PROGRAM ELEMENT NO. INE624	
		11. CONTRACT/GRANT NO. 68-02-2608, Task 54	
12. SPONSORING AGENCY NAME AND ADDRESS EPA, Office of Research and Development Industrial Environmental Research Laboratory Research Triangle Park, NC 27711		13. TYPE OF REPORT AND PERIOD COVERED Task Final; 5/79-5/80	
		14. SPONSORING AGENCY CODE EPA/600/13	
15. SUPPLEMENTARY NOTES IERL-RTP project officer C.J. Chatlyne is no longer with EPA; for details, contact Michael C. Osborne, Mail Drop 62, 919/541-3996.			
16. ABSTRACT The report gives results of a search of U.S. literature to identify published information about trace metals and Stationary Conventional Combustion Processes (SCCPs). The search was initially computerized with later cross referencing from identified reports. The report summarizes the information found in the literature and includes specific references. It summarizes what has been published about ambient trace metals in air, water, and soils. A survey, reporting the trace metal concentration in combustible fuels, identifies coal as the fuel of most concern; generally, trace metal levels in coal are similar to their crustal abundances. It reviews conventional combustion technology. It discusses trace metal flows and partitioning around various types of boilers and pollution control devices, and reports data from cited studies. In addition to coal, the report gives data for oil, municipal refuse, and wood. It also covers emissions to air, water, and soil, including trace metal leaching. It documents the health and environmental effects of trace metals. Where possible, it assesses specific contributions from SCCPs. It covers environmental transport systems, as well as special problems associated with radioactive metals and SCCPs.			
17. KEY WORDS AND DOCUMENT ANALYSIS			
a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Pollution		Pollution Control	13B
Trace Elements		Stationary Sources	06A 14G
Radioactive Materials		Trace Metals	18H 11L
Combustion Products		Municipal Refuse	21B 07D, 07A
Coal			21D
Boilers			13A
18. DISTRIBUTION STATEMENT Release to Public		19. SECURITY CLASS (This Report) Unclassified	21. NO. OF PAGES 106
		20. SECURITY CLASS (This page) Unclassified	22. PRICE

IERL/RTP-1080

DCN 80-202-187-54-23
Radian Contract #202-187-54

EPA-600/7-80-155b
25 April 1980

TRACE METALS AND STATIONARY CONVENTIONAL
COMBUSTION SOURCES (SCCP's)

Volume 2

B I B L I O G R A P H Y

by

Larry O. Edwards (Project Director)
Charles A. Muela
Ralph E. Sawyer
Carol May Thompson
Damon H. Williams
R. Dean Delleney (Program Manager)

Radian Corporation
Austin, Texas 78703

EPA Contract #68-02-2608

Chuck Chatlyne, Project Officer
Industrial Environmental Research Laboratory (IERL/RTP)
U.S. Environmental Protection Agency
Research Triangle Park, N. C. 27711

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA 22161

DISCLAIMER

This report has been reviewed by the Industrial and Environmental Research Laboratory, U.S. Environmental Protection Agency, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the U.S. Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

ABSTRACT

This is the bibliography of a two-volume report that gives results of a search of U.S. literature to identify published information about trace metals and Stationary Conventional Combustion Processes (SCCPs). The search was initially computerized with later cross referencing from identified reports. The report summarizes the information found in the literature and includes specific references. It summarizes what has been published about ambient trace metals in air, water, and soils. A survey, reporting the trace metal concentration in combustible fuels, identifies coal as the fuel of most concern; generally, trace metal levels in coal are similar to their crustal abundances. It reviews conventional combustion technology. It discusses trace metal flows and partitioning around various types of boilers and pollution control devices, and reports data from cited studies. In addition to coal, the report gives data for oil, municipal refuse, and wood. It also covers emissions to air, water, and soil, including trace metal leaching. It documents the health and environmental effects of trace metals. Where possible, it assesses specific contributions from SCCPs. It covers environmental transport systems, as well as special problems associated with radioactive metals and SCCPs.

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION.....	1
AMBIENT CONDITIONS.....	6
FUEL SOURCES.....	16
COMBUSTION AND CONTROL TECHNOLOGIES.....	31
EMISSIONS.....	39
ENVIRONMENTAL AND HEALTH EFFECTS.....	62
RADIATION.....	79
ACCURACY OF DATA AND ANALYTICAL TECHNIQUES.....	83
REGULATIONS.....	91
RESEARCH NEEDS.....	99

INTRODUCTION

The Environmental Protection Agency (EPA) in 1977 chartered the Conventional Combustion Environmental Assessment (CCEA) program to assess the impact of conventional combustion upon the environment and human health and to study and recommend methods for controlling adverse effects. One phase of that program was to study the impact and controls of Stationary Conventional Combustion Processes (SCCP's). The first step in such a program is to collect and review what is already known about SCCP emissions. The purpose of this present study is to identify and review all literature pertaining to trace metals and SCCP's. Four documents will result:

- a 438 page review (with references) of trace metals and SCCP's,
- a 30 page technical summary and overview,
- a 10 page executive summary, and
- a complete bibliography, alphabetized by subject, of all articles identified in the project (this document).

SCCP's include utility, industrial, commercial and residential combustion facilities; trace metals are taken to be essentially all metals (for example, all metals exist in trace amounts in the atmosphere), and most of the semi-metals. Fuels considered include coal, oil, natural gas, wood and refuse. Certain industrial processes which are believed to contain trace metals were not included within the definition of SCCP used herein; examples are industries such as cement, smelters, glass, paper, phosphate.

The primary source of SCCP trace metal emissions comes from coal combustion in the utility sector. This has also been the area of greatest study. Over 90% of the articles identified in this work concerned coal-fired power plants, and the space devoted to such processes in this bibliography reflects that proportion.

LITERATURE SEARCH

One of the major purposes of this project was to conduct an extensive literature search and to publish a bibliography covering trace metal emissions from SCCP's. Since much of the data gathered before 1970 is of variable quality, due to the technology of the times, and computer data bases were established at about that same time, a computerized search was chosen as the principle search method. To convey the extent of the search and to inform anyone interested in extending the search, a complete review of the strategy used follows.

Three data base vendor systems were searched for information: Lockheed Retrieval Services (DIALOG®), National Library of Medicine (MEDLARS), and Department of Energy (DOE/RECON). Specific data bases searched are given in Table 1-2.

TABLE 1-2. DATABASES SEARCHED IN LITERATURE REVIEW

<u>MEDLARS</u>	<u>DIALOG®</u>
Cancerproj	Chemical condensates (Chemical Abstracts)
Toxline	NTIS (U.S. Government reports and announcements)
Medline	
<u>DOE/RECON</u>	SSIE (Smithsonian Science Information Exchange)
Energy Data Base	Excerpta Medica
Energy R&D Projects	APTIC (Air Pollution Technical Information Center)
	Dissertation Abstracts
	Magazine Index
	Environmental Periodicals Bibliography

(continued)

Energyline
 BIOSIS (Biological Abstracts)
 Compendex (Engineering Index)
 Pollution
 Enviroline
 Monthly Catalogue

The search was run three times based on three requests. The first search included only coal combustion. The list of terms used appear in Table 1-3.

TABLE 1-3. TERMS USED IN INITIAL LITERATURE SEARCH

A	B	C
Coal	Trace Metals	Liquefaction
	Trace Elements	Gasification
	Heavy Metals	Fluidized bed combustion
	Carcenogens	
	Baghouse	SO _x , NO _x , SO ₂
	Dust	Desulfurization
	Illness	Mines
	Electrostatic Precipitators	Mining
	Health	
	Fly Ash	
	Filtration	
	Scrubber	
	Toxic	

A was "anded" with B; therefore each abstract had to have the word "coal" and one of the terms from column B. C was "notted" from A and B, which means if any term from column C was in an abstract that contained terms from A and B, the abstract was not printed.

The second search was broadened to include all combustion terms, using the word "COMBUSTION" in column A. The same terms in column B were used, but column C was expanded to include coal, mobile sources, ships, aircraft, automotive fuels, automobiles and miners.

The third request was a search on Trace element or metal concentrations in ambient air, water, and soil. The strategy is listed in Table 1-4.

TABLE 1-4. TERMS USED IN THIRD LITERATURE SEARCH

A	B	C
Trace elements	Ambient	Air
Trace metals		Water
		Soil

Each column was "anded" together, meaning at least one term in each column had to be included in the final abstract. Databases searched for this request included: COMPENDEX, NTIS, CHEM condensates, Monthly catalog, APTIC, Conference papers, ENVIROLINE, and Pollution.

These searches produced about 20,000 titles and abstracts. The citations were reviewed and only English language articles published in the United States and specifically referring to some aspects of trace metals and SCCP's were retained. This procedure lowered the number of relevant citations to about 1,000 and they are all contained in this bibliography. The bibliography is broken down into broad subject categories similar to the section sequence in the main report. Repetitions may occur, but each topical section has been designed to include all relevant citations.

With the large volume of published works available, a manual literature search is impractical. Information retrieval from computerized information sources is the state-of-the-art. However, it was discovered that some important articles were not picked up. This was particularly true of federal government publications (such as EPA), in spite of the claims made by the data base vendors. The problem probably lies in the strategy used herein and the shortcomings of the "key wording" of the reports.

Some articles of interest were picked up from references listed in reports that were reviewed, particularly older articles. Ideally, 100 percent closure of the references was sought (that is, all key references in articles refer to already identified reports), but this was not quite achieved. It is felt that all major articles, through at least 1977, are included within the references of this report and closure is 95 percent complete.

Some non-bibliographic references were included in the list of relevant citations, such as reports of ongoing research and research proposals. Some of these research groups were contacted to confirm the nature and the stage of the research; these data are included in the text, but not referenced in the bibliography. As a prelude to this report, EPA published in July 1978, a survey of projects relating to the CCEA program (Thompson, W. E. and J. W. Harrison. Survey of Projects Concerning Conventional Combustion Environmental Assessment. EPA 600/7-78-139, Research Triangle Park, North Carolina, 1978.) Included in that report were tables of current research activities. That publication should serve as a compliment to the bibliographic citations discussed in this report.

AMBIENT CONDITIONS

- Anderson, D. M., J. Lieben, and V. H. Sussman. Pure Air for Pennsylvania. Public Health Service, Cincinnati, Ohio, 1961. 144pp.
- Anderson, W. L., and K. E. Smith. Dynamics of Mercury at Coal-Fired Power Plant and Adjacent Cooling Lake. Environ. Sci. Technol., 11(1):75-80, 1977.
- Andren, A. W., D. H. Klein, and Y. Talmi. Selenium in Coal Fired Steam Plant Emissions. Environ. Sci. Technol., 9(9):856-858, 1975.
- Auer, A. H. Jr., and M. J. Komp. The Behavior of Aitken Nucleus Plumes from Coal-Fired Power Plants in the Midwest. In: Joint Conference on Applications of Air Pollution Meteorology, American Meteorological Society, Salt Lake City, Utah, 1977, pp.29-32.
- Bach, W., and A. Daniels. Handbook of Air Quality in the United States. Honolulu, Hawaii, Oriental, 1975.
- Baseline Studies of Heavy Metal, Halogenated Hydrocarbon, and Petroleum Hydrocarbon Pollutants in the Marine Environment and Research Recommendations, IDOE Baseline Conference, May 1972. National Science Foundation, New York, 1972.
- Berry, W. L., and A. Wallace. Trace Elements in the Environment: Their Role and Potential Toxicity as Related to Fossil Fuels. A Preliminary Study. UCLA-12-946, University of California, Los Angeles, California, 1974. 72pp.
- Block, C., and R. Dams. Study of Fly Ash Emission During Combustion of Coal. Environ. Sci. Technol., 10(10):1011-1017, 1976.
- Bolton, N. E., J. A. Carter, J. F. Emery, et al. Trace Element Mass Balance Around a Coal-Fired Steam Plant. Adv. Chem. Ser., (141):175-187, 1975.
- Bright, R., et al. Air Quality Policy Analysis of Electric Utilities: A Regional Perspective. ANL/ES-42, Argonne National Lab., Argonne, Illinois, 1975.

Cadmium and Cadmium Compounds. In: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemical to Man: Some Inorganic and Organometallic Compounds. Vol. 2, International Agency for Research on Cancer Working Groups on the Evaluation of Carcinogenic Risk of Chemicals to Man, eds., 1973. pp.74-99.

Cleland, J. G., and G. L. Kingsbury. Multimedia Environmental Goals for Environmental Assessment. EPA 600/7-77-136a, b, Research Triangle Institute, Research Triangle Park, North Carolina, 1977.

Cohan, L. J., J. H. Fernandes, M. E. Maguire, and R. C. Shenk. Prepared vs. Unprepared Refuse Fired Steam Generators. In: 1st International Conference on Conversion of Refuse to Energy, Montreux, Switzerland, 1975. pp.407-415.

Coltharp, W. M., N. P. Meserole, B. F. Jones, K. Schwitzgebel, R. S. Merrill, G. L. Sellman, C. M. Thompson, and D. A. Malish. Review and Assessment of the Existing Data Base Regarding Flue Gas Cleaning Wastes. Radian Corp., Austin, Texas,

Dams, R. J., J. A. Robbins, K. A. Rahn, and J. W. Winchester. Quantitative Relationships Among Trace Elements Over Industrialized N.W. Indiana, Paper 1AEA-SM-142a/5. In: Proceedings of the Nuclear-Based Techniques in Environmental Pollution, International Symposium, Salsburg, Austria, 1970. IAEA, Vienna, Austria, 1970. pp.139-157.

Davis, W. E. National Inventory of Sources and Emissions. Barium, Boron, Copper, Selenium, and Zinc 1969. Boron, Section II. APTD-1159, PB 210 677, Davis (W.E.) and Associates, Leawood, Kansas, 1972. 51pp.

Davis, W. E. National Inventory of Sources and Emissions. Barium, Boron, Copper, Selenium, and Zinc 1969. Copper, Section III. APTD-1129, PB-210 678, Davis (W.E.) and Associates, Leawood, Kansas, 1972. 74pp.

Davison, R. L., D. F. S. Natusch, J. R. Wallace, and C. A. Evans, Jr. Trace Elements in Fly Ash. Dependence of Concentration on Particle Size. Environ. Sci. Technol., 8(13):1107-13, 1974.

DeMartini, F. E. The Significance of Particulate Emissions in Community Air Pollution. Presented at the Symposium on Particulate Emissions, Philadelphia, Pennsylvania, 1957. pp.3-20

Dzubay, T. G., and R. K. Stevens. Ambient Air Analysis with Dichotomous Sampler and X-Ray Fluorescence Spectrometer. Env. Sci. Tech., 9(7):663, 1975.

Edwards, H. A., C. Hill, and W. O. Ursenbach. Application of Scanning Electron Microscopy to Identification and Estimation of Natural and Man-Made Dusts in Arid Regions. Chemosphere, 1(3):107-112, 1972.

Eimutis, E. C., and R. P. Quill. Source Assessment: Noncriteria Pollutant Emissions. MRC-DA-692, PB-270 550, Monsanto Research Corp., Dayton, Ohio, 1977. 116pp.

Eisenbud, M., and T. J. Kneip. Trace Metals in Urban Aerosols. EPRI-117-FR, PB-248 324, New York University, New York, 1975. 440pp.

Ethyl Corp., eds. A Consideration of the Public Health Aspects of Manganese in the Environment. New Orleans, Louisiana, 1971. 3pp.

Flocchini, R. G., T. A. Cahill, D. J. Shadoan, S. J. Lange, R. A. Eldred, P. J. Feeney, G. W. Wolfe, D. C. Simmeroth, and J. K. Suder. Monitoring California's Aerosols by Size and Elemental Composition. Env. Sci. Technol., 10(1):76, 1976.

Gasper, J. R., and P. A. Dauzvarida. Assessment of Trace Element Body Burdens Due to Projected Coal Utilization in the Illinois River Basin. In: Proceedings of the 5th National Conference on Energy and the Environment, American Institute of Chemical Engineers, Cincinnati, Ohio, 1977. pp.350-354.

Gesell, T. F., and H. M. Prichard. The Technologically Enhanced Natural Radiation Environment. Hlth. Phys., 28(4):361-366, 1975.

Giauque, R. D., L. Y. Goda, and N. E. Brown. Characterization of Aerosols in California by X-Ray Fluorescence Analysis. TID-4500-R61. In: Nuclear Chemistry Annual Report 1973. Lawrence Berkeley Laboratory, Berkeley, California, 1974. pp.409-410.

Glass, G. E. Ecological Effects of Coal-Fired Steam-Electric Generating Stations. Presented at the Third National Conference Interagency Energy/Environment Research and Development Program, Washington, D.C., 1978.

Gordon, G. E., and W. H. Zoller. Normalization and Interpretation of Atmospheric Trace Element Concentration Patterns. CONF-730802. In: Proceedings of the 1st Annual NSF Trace Contaminant Conference, 1973. National Technical Information Service, Springfield, Virginia, 1974. pp.314-325.

Greifer, B., and J. K. Taylor. Pollutant Analysis Cost Survey. EPA-650/2-74-125, PB-241 991, National Bureau of Standards, Washington, D.C., 1974. 211pp.

Hall, E. H., C. M. Allen, D. A. Ball, J. E. Burch, H. N. Conkle, W. T. Lawhon, T. J. Thomas, and G. R. Smithson, Jr. Comparison of Fossil and Wood Fuels, Final Report. EPA 600/2-76-056, PB 251 622, Battelle-Columbus Laboratory, Columbus, Ohio, 1976.

Hall, S. K. Pollution and Poisoning. Environ. Sci. Technol., 6(1):31-35, 1972.

Hamburg, F. C., et al. Gases and Particulates Control. Part II. In: 3rd Energy and the Environment Conference, American Institute of Chemical Engineers, Ohio, 1975. p.325.

Hammerle, R. H., and W. R. Pierson. Sources and Elemental Composition of Aerosols in Pasadena, California, by Energy Dispersive X-Ray Fluorescence. Environ. Sci. Technol., 9(12):1058-1068, 1975.

Hardy, K. A., R. Akselsson, J. W. Nelson, and J. W. Winchester. Elemental Constituents of Miami Aerosol as Function of Particle Size. Environ. Sci. Technol., 10(2):176-182, 1976.

Hart, F. C., and B. T. DeLaney. The Impact of RCRA (PL 94-580) on Utility Solid Wastes. EPRI FP-878, EPRI TPS 78-779, Fred C. Hart Associates, Inc., New York, 1978.

Haws, R. C., R. E. Paddock, and C. C. Masser. The Regional Air Pollution Study (RAPS) Grid System. EPA 450/3-76-021. Research Triangle Institute and Environmental Protection Agency, Research Triangle Park, North Carolina, 1975.

Heit, M. Review of Current Information on Some Ecological and Health Related Aspects of the Release of Trace Metals into the Environment Associated with the Combustion of Coal. HASL-320, U.S. Energy Research and Development Administration, New York, 1977. 53pp.

Hilst, G. R. Detection of Large-Scale Effects of Air Pollution. Paper 26d. Presented at the 64th Annual American Institute of Chemical Engineers Meeting, San Francisco, California, 1971.

Hunt, W. F. Jr., et al. National Air Quality and Emission Trends Report, 1976. Environmental Protection Agency, Office of Air Quality Planning and Standards, Office of Air and Waste Management, 1977.

Jervis, R. E., J. J. Paciga, and A. Chattopadhyay. Characterization of Urban Aerosols and Their Hazard Assessment by Size Sampling Combined with Inter-Element Ratios. Presented at the International Symposium on the Development of Nuclear-Based Techniques for the Measured Environmental Pollutants, Vienna, Austria, 1976.

Kaakinen, J. W., R. M. Jorden, M. H. Lawasani, and R. E. West. Trace Element Behavior in Coal Fired Power Plant. Environ. Sci. Technol., 9(9):862-869, 1975.

King, R. B., J. S. Fordyce, A. C. Antoine, H. F. Leibecki, H. E. Neustadter, and S. M. Sidik. Elemental Composition of Airborne Particulates and Source Identification: An Extensive One Year Survey. APCA J., 26(11):1073, 1976.

- Klein, D. H., and P. Russell. Heavy Metals: Fallout Around a Power Plant. *Environ. Sci. Technol.*, 7(4):357-358, 1973.
- Lagerwerff, J. V., D. L. Bower, and G. T. Biersdorf. Accumulation of Cadmium, Copper, Lead and Zinc in Soil and Vegetation in the Proximity of a Smelter. In: 6th Annual Conference on Trace Substances and Environmental Health Proceedings, University of Missouri, 1972. pp.71-78.
- Lave, L. B., and L. C. Freeburg. Health Effects of Electricity Generation from Coal, Oil, and Nuclear Fuel. *Nucl. Saf.*, 14(5):409-428, 1973.
- Lee, R. E. Jr., and D. J. von Lehmden. Trace Metal Pollution in the Environment. *APCA J.*, 23(10):853-857, 1973.
- Lee, R. E. Jr., H. L. Crist, A. E. Riley, and K. E. MacLeod. Concentration and Size of Trace Metal Emissions from a Power Plant, a Steel Plant, and a Cotton Gin. *Environ. Sci. Technol.*, 9(7):643-647, 1975.
- Lindberg, S. E., A. W. Andren, R. J. Raridon, and W. Fulkerson. Mass Balance of Trace Elements in Walker Branch Watershed: Relation to Coal-Fired Steam Plants. *Environ. Health Perspect.*, 12:9-18, 1975.
- Lopez, A. G., and F. H. Cooper, Jr. Trace Element Precipitation Scavenging Analysis Through X-Ray Fluorescence. Paper 76-31. In: Proceedings of the 69th Annual Air Pollution Control Association Meeting, Portland, Oregon, 1976, Volume 3. 17pp.
- Lyon, W. S. Atmospheric Modeling and Discharge. In: Trace Element Measurements at the Coal-Fired Steam Plant, W. S. Lyon, Jr., CRC Press, Cleveland, Ohio, 1975. pp.107-117.
- Lyon, W. S. Environmental Studies. In: Trace Element Measurements at the Coal-Fired Steam Plant, W. S. Lyon, Jr., CRC Press, Cleveland, Ohio, 1975. pp.91-105.
- Lyon, W. S. Trace Element Measurements at a Coal-Fired Steam Plant. CRC Press, Cleveland, Ohio, 1977.
- Martens, C. S., J. J. Wesolowski, R. Kaifer, W. John, and R. C. Harriss. Sources of Vanadium in Puerto Rican and San Francisco Bay Area Aerosols. *Environ. Sci. Technol.*, 7(9):817-820, 1973.
- Mason, B. Principles of Geochemistry. John Wiley and Sons, Inc., New York, 3rd Edition, 1976. pp.45-46.
- Maxwell, W. H. Stationary Source Testing at an Electric Power Plant at the Pacific Power and Light Company No. 1 Steam Plant Centralia, Washington. EPA 77-SPP-16, Midwest Research Institute, St. Louis, Missouri, 1977. 18pp.

McCurdy, R. F., and H. J. Paulus. Prediction of Heavy Metals in Settleable Particulates. Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 12(2):184-191, 1972.

McKnight, J. S. Effects of Transient Operating Conditions on Steam-Electric Generator Emissions. EPA 600/2-75-022, PB 247-701, Research Triangle Institute, Research Triangle Park, North Carolina, 1975.

Mesich, F. G., and H. L. Taylor. Levels of Trace Elements in the Ambient Air at Selected Locations in the Northern Great Plains. Radian Corp. and Acculabs Research, Austin, Texas, 1976.

Mezey, E. J., S. Singh, and D. W. Hissong. Fuel Contaminants: Volume 2. Removal Technology Evaluation. EPA 600/2-76/177b, PB-260 475, Battelle-Columbus Labs., Columbus, Ohio, 1976. 318pp.

Mezey, E. J., S. Singh, and D. W. Hissong. Fuel Contaminants: Volume I, Chemistry. EPA/600/2-76/177a, PB 256 020, Battelle-Columbus Labs., Columbus, Ohio, 1976. 177pp.

Monterio, S. C., and A. Pepe. Comparative Study of Methods for the Determination of Airborne Fluorides. Pure Appl. Chem., 24(4):707-714, 1970.

Moore, H. E., and S. E. Poet. Background Levels of ^{226}Ra in the Lower Troposphere. Atmos. Environ., 10(5):381-383, 1976.

Moore, H. E., E. A. Martell, and S. E. Poet. Sources of Polonium-210 in Atmosphere. Environ. Sci. Technol., 10(6):586-591, 1976.

Moore, W. W. Reduction in Ambient Air Concentrations of Fly Ash-Present and Future Prospects. In: Proceedings of the 3rd National Conference on Air Pollution, Public Health Service, 1966. pp.170-178.

Morgan, J. J., W. Bach, E. Eriksson, H. Flohn, K. Fraedrich, E. D. Goldberg, R. E. Hamilton, G. Haury, W. Jacobi, et al. Source Functions: Fossil Fuel Combustion Products, Radionuclides, Trace Metals, and Heat. Group Report. Presented at the Workshop on Global Chemical Cycles and Their Alterations on Man, Dahlem, Germany.

Munshower, F. F., and E. J. Deput. The Effects of Stack Emissions on the Range Resource in the Vicinity of Colstrip, Montana: Progress Report 1975. RR-98, PB 269 120, Montana Agricultural Experiment Station, Bozeman, Montana, 1976. 122pp.

New Mexico, Health and Environment Department. Implementation Plan for the Attainment and Maintenance of National Ambient Air Quality Standards. Santa Fe, New Mexico, 1979.

North Carolina, State of, Department of Natural and Economic Resources. North Carolina Air Quality Maintenance Area Analysis, Final Report, Volume 4, Project Summary and Recommendations for the Charlotte, Winston-Salem and Greensboro AQMAs for 1973, 1975, 1980 and 1985. EPA 904/9-76-005d, Raleigh, North Carolina, 1976.

Palomba, J. Jr., and R. F. Wromble. An Appraisal of Air Pollution in Colorado. Colorado State Department of Public Health, Washington, D.C., 1962. 31pp.

Pezzetta, J. M., and I. K. Iskandar. Sediment Characteristics in the Vicinity of the Pulliam Power Plant, Green Bay, Wisconsin. *Env. Geology*, 1(3):155, 1975-1976.

Phillips, M. A. Investigations into Levels of Both Airborne Beryllium and Beryllium in Coal at the Hayden Power Plant near Hayden, Colorado. *Environ. Lett.*, 5(3):183-188, 1973.

Raridon, R. J. Pathways of Trace Elements in the Environment. Presented at the AAAS Conference, Denver, Colorado, 1977. 19pp.

Raridon, R. J., and A. W. Andren. Computer Simulation of Trace Metal Transport. In: International Conference Proceedings on Heavy Metals in the Environment, Volume 2, Part I, Toronto, Canada, 1975. pp.321-330.

Research Triangle Institute. State Air Data Information Survey. EPA 450/3-74-057, Research Triangle Park, North Carolina, 1974.

Research Triangle Institute. Summary of Key Federal Regulations and Criteria for Multimedia Environmental Control. Research Triangle Park, North Carolina, 1977.

Rhodes, J. R., A. H. Pradzynski, C. B. Hunter, J. S. Payne, and J. L. Lindgren. Energy Dispersive X-Ray Fluorescence Analysis of Air Particulates in Texas. *Env. Sci. Technol.*, 6(10):922, 1972.

Roffman, H. K., R. E. Kary, and T. Hudgins. Ecological Distribution of Trace Elements Emitted by Coal-Burning Power Generating Units Employing Scrubbers and Electrostatic Precipitators. In: Papers from the Symposium on Coal Mine Drainage Research, 1977. National Coal Association, Washington, D.C., 1977. pp.192-215.

Ross, W. D., J. L. Pyle, and R. E. Sievers. Analysis for Beryllium in Ambient Air Particulates by Gas Chromatography. *Environ. Sci. Technol.*, 11(5):467, 1977.

Schulte, H. F. Effects of Chemical Pollutants on Man, Now and in the Future. In: Energy and the Environment-Cost Benefit Analysis, R. A. Karam and K. J. Morgan, eds. Pergamon Press, Elmsford, New York, 1976. pp.330-344.

Shilesky, D. M., and J. M. Wyatt. Combustion Processing of Sludge Potential Health and Nuisance Considerations. CONF-761211. Presented at the Third National Conference on Sludge Management, Disposal, and Utilization, Miami, Florida, 1976.

Spangler, C. V. National Inventory of Sources and Emissions: Manganese - 1968. APTD-1509, PB 220 620, Davis (W.E.) and Associates, Leawood, Kansas, 1971. 70pp.

Strojan, C. L., and F. B. Turner. Trace Elements and Sulfur in Soils and Plants Near the Mohave Generating Station in Southern Nevada. Presented at the 4th Joint Conference on Sensing of Environmental Pollution, New Orleans, Louisiana, 1977.

Struempler, A. W. Trace Element Composition in Atmospheric Particulates During 1973 and the Summer of 1974 at Chadron, Nebraska. Environ. Sci. Technol., 9(13):1164-1168, 1975.

Struempler, A. W. Trace Metals in Rain and Snow During 1973 at Chadron, Nebraska. Atmos. Environ., 10(1):33-37, 1976.

Styron, C. E., and B. Robinson. Preliminary Radiological Impact Assessment of Western Coal Utilization. In: Joint Conference on Sensing of Environmental Pollutants. American Chemical Society, New Orleans, Louisiana, 1977. pp.336-338.

Sullivan, R. J. Air Pollution Aspects of Chromium and its Compounds. (3)PH-22-68-25, PB-188075, Litton Systems, Inc., Bethesda, Maryland, 1969. 86pp.

Thom, G. C., and W. R. Ott. Air Pollution Indices, a Compendium and Assessment of Indices Used in the United States and Canada. CEQ and EPA, Council on Environmental Quality and the Environmental Protection Agency, 1975.

Tullar, I. V., and I. H. Suffet. The Fate of Vanadium in an Urban Air Shed: The Lower Delaware River Valley. APCA J, 25(3):282-286, 1975.

Twitty, J. T., and J. A. Weinman. Radiative Properties of Carbonaceous Aerosols. J. Appl. Meteorol., 10(4):725-731, 1971.

U.S. Department of Health, Education, and Welfare, Public Health Service. Nationwide Inventory of Air Pollution Emissions. Raleigh, North Carolina, 1970.

U.S. Environmental Protection Agency. State Air Pollution Implementation Plan Progress Report, January 1 to June 30, 1975. Washington, D.C., 1975.

U.S. Environmental Protection Agency, Air Program Strategy For Attainment and Maintenance of Ambient Air Quality Standards and Control of other Pollutants. Washington, D.C., 1976.

U.S. Environmental Protection Agency. National Primary and Secondary Ambient Air Quality Standards for Lead. Fed. Reg., 43(194):46246-46277, 1978.

U.S. Environmental Protection Agency. 1972 National Emissions Report. National Emissions Data System (NEDS) of the Aerometric and Emissions Reporting System (AEROS). EPA 450/2-74-012, Research Triangle Park, North Carolina, 1974.

U.S. Environmental Protection Agency. 1973 National Emissions Report. EPA 450/2-76-007. Research Triangle Park, North Carolina, 1976.

U.S. Environmental Protection Agency. Proposed National Emission Standards for Hazardous Air Pollutants: Asbestos, Beryllium, Mercury. Research Triangle Park, North Carolina, 1971.

U.S. Environmental Protection Agency. Air Quality Data for Non-Criteria Pollutants - 1971 Through 1975. EPA-450/2-78-001. Research Triangle Park, North Carolina, 1978.

U.S. Environmental Protection Agency. Methods of Chemical Analysis of Water and Wastes. EPA 625/6-74-003. Environmental Protection Agency, Office of Technology Transfer, Washington, D.C., 1974.

U.S. National Air Pollution Control Association. National Emissions Standards Study Report, Appendix, 3 Volumes. 1970.

U.S. Environmental Protection Agency. National Air Trends in Trace Metals in Ambient Air, 1965-1974. EPA/450-1-77/003. PB-264 906/9BE, Research Triangle Park, North Carolina, 1977. 41p.

U.S. Environmental Protection Agency, Office of Air Programs. Air Quality Data for 1968. APTD 0978. Research Triangle Park, North Carolina, 1972.

Vitez, B. Trace Elements in Flue Gases and Air Quality Criteria. Power Eng., 80(1):56-60, 1976.

Wagenet, R. J., W. J. Grenney, and J. J. Jurniak. Erosion Model for Arid Wildland Watersheds. Paper 77-2510. Presented at the ASAE Winter Meeting, Chicago, Illinois, 1977. 23pp.

Wagenet, R. J., W. J. Grenney, and J. J. Jurinak. Environmental Transport Model of Heavy Metals. ASCE J. Environ. Eng. Div., 104(1):61-76, 1978.

Winchester, J. W. Natural and Pollution. Sources of Trace Elements in Atmospheric Particulates. AIChE Symp. Ser. 71(149):16-18, (1975).

Zurlo, N. Methods for the Determination of Fluorine Compounds in the Working and Environmental Atmosphere of Aluminum Reduction Plants. Presented at the 100th Annual Meeting, American Institute of Mining, Metallurgical and Petroleum Engineers, New York, 1971. 15pp.

FUEL SOURCES

- Abel, K. H., and L. A. Rancitelli. Major, Minor, and Trace Element Composition of Coal and Fly Ash, as Determined by Instrumental Neutron Activation Analysis. *Adv. Chem. Ser.*, 141:118-38, 1975.
- Abel, W. T., M. Zulkoski, and G. J. Gauntlett. Dry Separation of Pyrite from Coal. *Ind. Eng. Chem. Prod. Res. Develop.*, 11(3):342-347, 1972.
- Abernethy, R. F., and R. H. Gibson. Rare Elements in Coal. IC 8163, Bureau of Mines, 1962.
- Altschuler, Z. S. Coal Resources - A Continuing Assessment. In: 5th AIChE National Conference Proceedings on Energy and the Environment, Cincinnati, Ohio, 1977. pp.249-263.
- Anderson, D. Emission Factors for Trace Substances. EPA 450/2-73-001, PB 230 894/AS, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1973. 82pp.
- Anderson, W. L., and K. E. Smith. Dynamics of Mercury at Coal-Fired Power Plant and Adjacent Cooling Lake. *Environ. Sci. Technol.*, 11(1):75-80, 1977.
- Anit, W. U., R. G. Senechal, and W. E. Erlebach. Isotopic Composition as a Natural Tracer of Lead in the Environment. *Environ. Sci. Technol.*, 4(4):305-317, 1970.
- Aruscavage, P. Determination of Arsenic, Antimony, and Selenium in Coal by Atomic Absorption Spectrometry with a Graphite Tube Atomizer. *Res. U.S. Geol. Surv.*, 5(4):405-408, 1977.
- Auerback, S. I. Trace Contaminants Measurements at and Around the Allen Steam Plant Facility. ORNL-4848, Oak Ridge National Laboratory, Oak Ridge, Tennessee, 1972. pp.53-54.
- Averitt, P., et al. Minor Elements in Coal-A Selected Bibliography. *U.S. Geol. Surv.*, 1976.
- Ayer, F. A. Environmental Aspects of Fuel Conversion Technology. Symposium Proceedings, St. Louis, Missouri, 1974.

Babu, S. P. Trace Elements in Fuel. 166th Meeting of the Division of Fuel Chemistry, American Chemical Society, Chicago, Illinois, 1973. Washington, D.C., ACS, 1975.

Ball, D. A., P. R. Beltz, P. Smith, R. B. Engdahl, and W. T. Reid. Annotated Bibliography on Supplemental Firing of Municipal Solid Waste in Electric Utility Boilers. EPRI-FP-678, Battelle-Columbus Labs., Columbus Ohio, 1978.

Billings, C. E., and W. R. Matson. Mercury Emissions from Coal Combustion. Science, 176(4040):1232-1233, 1972.

Block, C., and R. Dams. Lead Contents of Coal, Coal Ash and Fly Ash. Water Air Soil Pollut., 5(2):207-211, 1975.

Bolton, N. E., J. A. Carter, J. F. Emery, C. Feldman, W. Fulkerson, L. D. Hulett, and W. S. Lyon. Trace Element Mass Balance Around a Coal Fired Steam Plant. Chapter 13. In: Babu, S.P. Trace Elements In Fuel. A Symposium Sponsored by the Division of Fuel Chemistry at the 166th Meeting of the American Chemical Society, Chicago, Illinois, August 30, 1973. Washington, D.C., ACS, 1975. pp.175-187.

Bolton, N. E., J. A. Carter, J. F. Emery, et al. Trace Element Mass Balance Around a Coal-Fired Steam Plant. Adv. Chem. Ser., (141):175-187, 1975.

Bolton, N. E., W. Fulkerson, R. I. Van Hook, W. S. Lyon, and A. W. Andren. Trace Element Measurements at the Coal-Fired Allen Steam Plant. Oak Ridge National Laboratory, NSF EP-43, Oak Ridge National Labs., Oak Ridge, Tennessee, 1973.

Boulding, R. What is Pure Coal? Environment, 18(1):12-17,35-36, 1976.

Brown, J., and A. Guest. Continuing Analysis of Trace Elements in Coal. Hydro-Electric Power Commission of Ontario Research Division, Toronto, Ontario, Canada, 1973.

Brown, O. D. Energy Generation from Wood Wastes. Presented at the International District Heating Association Meeting, French Lick, Indiana, 1973.

Cadmium and Cadmium Compounds. In: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemical to Man: Some Inorganic and Organometallic Compounds. Vol. 2, International Agency for Research on Cancer Working Groups on the Evaluation of Carcinogenic Risk of Chemicals to Man, eds., 1973. pp.74-99.

- Cahill, R. A., J. K. Kuhn, G. B. Dreher, R. R. Ruch, H. J. Gluskoter, and W. G. Miller. Occurrence and Distribution of Trace Elements in Coal. Am. Chem. Soc. Div. Fuel Chem. Prepr., 21(7):90-103, 1976.
- Campbell, J. A., J. C. Laul, K. K. Nielson, and R. D. Smith. Separation and Chemical Characterization of Finely-Sized Fly-Ash Particles. Anal. Chem., 50(8):1032-1040, 1978.
- Campbell, W. J. Metals in the Wastes we Burn? Environ. Sci. Technol., 10(5):436-439, 1976.
- Capes, C. E., A. E. McIlhinney, D. S. Russell, and A. F. Sirianni. Rejection of Trace Metals from Coal During Beneficiation by Agglomeration. Environ. Sci. Technol, 8(1):35-38, 1974.
- Carter, J. A., D. L. Donohue, and J. C. Franklin. Trace Metal Analysis in Coal by Multi-element Isotope Dilution Spark Source Mass Spectrometry. Am. Chem. Soc. Div. Fuel Chem. Prepr., 22(5):60-63, 1977.
- Carter, J. A., R. L. Walker, and J. R. Sites. Trace Impurities in Fuels by Isotope Dilution Mass Spectrometry. Am. Chem. Soc. Div. Fuel Chem. Prepr., 18(4):78-91, 1973.
- Cato, G. A. Field Testing: Trace Element and Organic Emissions from Industrial Boilers. EPA 600/2-76-086b, PB-261 263, KVB Engineering, Inc., Tustin, California, 1976. 160pp.
- Cavallaro, J. A., A. W. Duerbrouck, and A. F. Baker. Recent Advances in Air Pollution Control. Amer. Inst. Chem. Eng. Symp. Ser., 70(137):114-122, 1974.
- Cavallaro, J. A., G. A. Gibson, and A. W. Duerbrouck. A Washability and Analytical Evaluation of Potential Pollution from Trace Elements in Coal. U.S. DOE, Washington, D.C., 1978.
- Cleaning Coal by Solvent Refining. Environ. Sci. Technol, 8(6):510-511, 1974.
- Coles, D. G., R. C. Ragaini, and J. M. Ondov. Behavior of the Natural Radionuclides in Western Coal-Fired Power Plants. Am. Chem. Soc. Div. Fuel. Chem. Prepr., 22(4):156-161, 1977.
- Coniglio, W. R., and R. A. Harley. Mercury Balance on a Large Pulverized Coal-Fired Furnace. APCA J., 23:773-777, 1973.

Cooper, J. A., B. D. Wheeler, G. J. Wolfe, D. M. Bartell, and D. B. Schlafke. Determination of Sulfur, Ash and Trace Element Content of Coal, Coke and Fly Ash Using Multielement Tube-Excited X-Ray Fluorescence Analysis. In: Proceedings of ERDA Symposium on X- and Gamma-Ray Sources and Applications, Ann Arbor, Michigan, 1976. ERDA, Washington, D. C., 1976. pp. 169-172.

Coutant, R. W., J. S. McNulty, and R. D. Giammar. Determination of Trace Elements in Combustion Systems. EPRI-RP 122, W. F. Libby Labs., Palo Alto, California, 1974.

Cowherd, C. Jr., M. Marcus, C. M. Guenther, and J. L. Spigarelli. Hazardous Emission Characterization of Utility Boilers. EPA 650/2-75-066, Midwest Research Institute, 1975.

Ctvrtnicek, T. E., S. J. Rusek, and C. W. Sandy. Evaluation of Low-Sulfur Western Coal Characteristics, Utilization, and Combustion Experience. EPA 650/2-75-046. Monsanto Research Corp., Dayton, Ohio, 1975.

Davison, R. L., D. F. S. Natusch, J. R. Wallace, and C. A. Evans, Jr. Trace Elements in Fly Ash. Dependence of Concentration on Particle Size. Environ. Sci. Technol., 8(13):1107-13, 1974.

Durocher, N. L. Air Pollution Aspects of Boron and Its Compounds. Litton Systems, Inc., Bethesda, Maryland, 1969. 55pp.

Fancher, J. R. Trace Element Emissions from the Combustion of Fossil Fuels. In: Proceedings of the Environmental Resources Conference, Cycling Contributions of Metals, 1972. National Environmental Research Center, Cincinnati, Ohio, 1973. pp.109-113.

Filby, R. H. The Nature of Metals in Petroleum. In: Yen, T.F. The Role of Trace Metals in Petroleum. Ann Arbor Science, Ann Arbor, Michigan, 1975. pp.31-58.

Filby, R. H., and K. R. Shah. Neutron Activation Methods for Trace Elements in Crude Oil. In: Yen, T. F. The Role of Trace Metals in Petroleum. Ann Arbor Science, Ann Arbor, Michigan, 1975. pp.89-110.

Flagan, R. C., and S. K. Friedlander. Presented at Symposium on Aerosol Science and Technology, 82nd Meeting of AIChE, Atlantic City, New Jersey, 1976.

Ford, C. T. Coal Cleaning to Remove Trace Elements Prior to Utilization. Pap. Symp. Coal. Util., 4:146-191, 1977.

French, B. R. Fly-Ash Formation in a Coal-Fired Boiler. TID-27396, New Hampshire University, Durham, North Carolina, 1976. 72pp.

Frost, J. K., P. M. Santoliquido, L. R. Camp, and R. R. Ruch. Trace Elements in Coal by Neutron Activation Analysis with Radiochemical Separations. Adv. Chem. Ser., 141:84-97, 1975.

Gasper, J. R., and P. A. Dauzvarida. Assessment of Trace Element Body Burdens Due to Projected Coal Utilization in the Illinois River Basin. In: Proceedings of the 5th National Conference on Energy and the Environment, American Institute of Chemical Engineers, Cincinnati, Ohio, 1977. pp.350-354.

Giauque, R. D., R. B. Garrett, and L. Y. Goda. Determination of Forty Elements in Geochemical Samples and Coal Fly Ash by X-ray Fluorescence Spectrometry. Anal. Chem., 49(7):1012-1017, 1977.

Gibson, F. H., and W. A. Selvig. Rare and Uncommon Chemical Elements in Coal. Technical Paper 669, Bureau of Mines, 1944.

Given, P. H., R. N. Miller, N. Suhr, and W. Spackman. Major, Minor and Trace Elements in the Liquid Product and Solid Residue from Catalytic Hydrogenation of Coals. Adv. Chem. Ser., 188-191, 1975.

Gladney, E. S. Trace Element Emissions of Coal-Fired Power Plants. Chalk Point Electric Generating Station. Ph.D. Thesis, University of Maryland, College Park, Maryland, 1974. 372pp.

Gladney, E. S., W. H. Zoller, A. G. Jones, and G. E. Gordon. Composition and Size Distribution of Atmospheric Particulate Matter in Boston Area. Environ. Sci. Technol., 8:551-557, 1974.

Gluskoter, H. J. Mineral Matter and Trace Elements in Coal. Adv. Chem. Ser., 141:1-22, 1973.

Gluskoter, H. J., E. J. Kennedy, R. R. Ruch, and N. F. Shimp. NAA Determine Trace Elements in Coal and Lake Sediments. In: ANS Conference, University of Missouri, 1971. p.52.

Gluskoter, H. J., R. R. Ruch, W. G. Miller, R. A. Cahill, and G. B. Dreher. Trace Elements in Coal: Occurrence and Distribution. Geological Survey Report 499, Illinois State Geological Survey, 1977.

Goldgraben, G. R., K. Krickenberger, P. Clifford, N. Zimmerman, and D. Martin. Assessment of Mercury Emissions from Fossil Fueled Power Plants. EPA 600/7-78-146, PB-285 227, Mitre Corp., McLean, Virginia, Washington, D.C., 1978. 106pp.

Goldschmidt, V. M. In: Geochemistry, A. Muir, ed. Clarendon, Oxford, 1954.

Goldstein, H. L., and C. W. Siegmund. Influence of Heavy Fuel Oil Composition and Boiler Combustion Conditions on Particulate Emissions. Environ. Sci. Technol., 10(12):1109-1114, 1976.

Gordon, G. E., et al. Study of the Emissions from Major Air Pollution Sources and Their Atmospheric Interactions. University of Maryland, College Park, Maryland, 1974.

Gordon, G. E., W. H. Zoller, and E. S. Gladney. Abnormally Enriched Trace Elements in the Atmosphere. D. D. Hemphill, ed. In: Trace Substances in Environmental Health, VII, University of Missouri, Columbia, Missouri, 1973.

Guidoboni, R. J. Determination of Trace Elements in Coal and Coal Ash by Spark Source Mass Spectrometry. Anal. Chem., 45(7):1275-1277, 1973.

Hall, E. H., C. M. Allen, D. A. Ball, J. E. Burch, H. N. Conkle, W. T. Lawhon, T. J. Thomas, and G. R. Smithson, Jr. Comparison of Fossil and Wood Fuels, Final Report. EPA 600/2-76-056, PB 251 622, Battelle-Columbus Laboratory, Columbus, Ohio, 1976.

Hall, H. J., G. M. Varga, and E. M. Magee. Trace Elements and Potential Pollutant Effects in Fossil Fuels. EPA-650/2-74-118, Exxon Research Engineering Co., Linden, New Jersey, 1974. pp.35-47.

Harker, A. B., P. J. Pagni, T. Novakov, and L. Hughes. Manganese Emissions from Combustors. Chemosphere, 4(6):339-344, 1975.

Hart, F. C., and B. T. DeLaney. The Impact of RCRA (PL 94-580) on Utility Solid Wastes. EPRI FP-878, EPRI TPS 78-779, Fred C. Hart Associates, Inc., New York, 1978.

Haynes, B. W., S. L. Law, and W. J. Campbell. Metals in the Combustible Fraction of Municipal Solid Waste. RI-8244, U.S. Bureau of Mines, Washington, D.C., 1977. 20pp.

Headlee, A. J. W., and R. C. Hunter. Elements in Coal Ash and Their Industrial Significance. Ind. Eng. Chem., 45:548-551, 1953.

Horton, L., and K. V. Aurbrey. The Distribution of Minor Elements in Vitrain: Three Vitrains from the Barnsley Seam. J. Soc. Chem. Ind., London, 50:541-548, 1950.

Hulett, L. D., J. A. Carter, K. D. Cook, J. F. Emery, D. H. Klein, W. S. Lyon, G. A. Nyssen, W. Fulkerson, and N. E. Bolton. Trace Element Measurements at the Coal-Fired Allen Steam Plant--Particle Characterization. In: Coal Utilization Symposium Focus on SO₂ Emission Control, Louisville, Kentucky, 1974. National Coal Association, Washington, D.C., 1974. pp.207-213.

Johnson, R. L. Energy Recovery from Municipal Solid Waste, an Environmental and Safety Mini-Overview Survey. ATR-76(7618)-7, Aerospace Corp., Germantown, Maryland, 1976.

Jonasson, I. R., and R. W. Boyle. Geochemistry of Mercury and Origins of Natural Contamination of the Environment. Can. Mining Met. Bull., 65(717):32-39, 1972.

Joyce, A. T., and A. L. Higer. Land Use Monitoring, Paper PS4-1. Presented at the Symposium on Remote Sensing Applied to Energy-Related Problems, Miami, Florida, 1974.

Kaakinen, J. W. Trace Element Study in a Pulverized Coal Fired Power Plant. Ph.D., University of Colorado, Boulder, Colorado, 1974. 200pp.

Kaakinen, J. W., and R. M. Jorden. Determination of a Trace Element Mass Balance for a Coal-Fired Power Plant. CONF 730802. In: Proceedings of the 1st Annual NSF Trace Contaminants Conference, 1974. pp.165-184.

Kaakinen, J. W., R. M. Jorden, M. H. Lawasani, and R. E. West. Trace Element Behavior in Coal Fired Power Plant. Environ. Sci. Technol., 9(9):862-869, 1975.

Kalb, G. W. Total Mercury Mass Balance at a Coal-Fired Power Plant. Adv. Chem. Ser., 141:154-174, 1975.

Kessler, T. A., G. Sharkey, Jr., and R. A. Friedel. Spark-Source Mass Spectrometer Investigation of Coal Particles and Coal Ash. Bureau of Mines, Pittsburgh Energy Research Center, Respirable Dust Research Program, Pittsburgh, Pennsylvania, 1971.

Kessler, T., A. G. Sharkey, Jr., and R. A. Friedel. Analysis of Trace Elements in Coal By Spark-Source Mass Spectrometry. RI 7714, U.S. Bureau of Mines, Pittsburgh, Pennsylvania, 1973. 11pp.

Kilgore, J. D., L. J. Shannon, and P. Gorman. Environmental Studies on the St. Louis-Union Electric Refuse Firing Demonstration. In: Clean Fuels From Business, Sewage, Urban Refuse, Agricultural Wastes, Symposium Papers. Institute of Gas Technology, Chicago, Illinois, 1976. pp. 413-426.

Klein, D. H., A. W. Andren, J. A. Carter, et al. Pathways of Thirty-Seven Trace Elements through Coal Fired Power Plant. Environ. Sci. Technol., 9(10):973-979, 1975.

Knauer, H. E., and G. E. Milliman. Analysis of Petroleum for Trace Metals. Determination of Mercury in Petroleum and Petroleum Products. Anal. Chem., 47(8):1263-1268, 1975.

Kuhn, J. K., W. F. Harfst, and N. F. Shimp. X-ray Fluorescence Analysis of Whole Coal. Am. Chem. Soc. Div. Fuel Chem. Prepr., 18(4):72-77, 1973.

Kuhn, J. K., W. F. Harfst, and N. F. Shimp. X-ray Fluorescence Analysis of Whole Coal. Adv. Chem. Ser., 141:66-73, 1975.

Kukin, I. Additives Can Clean Up Oil-Fired Furnaces. Environ. Sci. Technol., 7(7):606-610, 1973.

Law, S. L. Metals in Ash Materials Filtered from Municipal Incinerator Effluents. Resource Recovery Conserv., 3(1):19-40, 1978.

Law, S. L., B. W. Haynes, and W. J. Campbell. Metals in the Combustible Fraction of Municipal Solid Waste. Presented at the American Chemical Society 11th Middle Atlantic Regional Meeting, Washington, D.C., 1977.

Law, S. L., H. E. Marr III, and W. J. Campbell. Concentration and Source of Trace Elements in the Combustible Fraction of Urban Refuse. In: Proceedings of the Fifth Mineral Waste Utilization Symposium, E. Aleshin, ed., 1976. pp.251-252.

Lee, R. E. Jr., and D. J. von Lehmden. Trace Metal Pollution in the Environment. APCA J., 23(10):853-857, 1973.

Lee, R. E. Jr., H. L. Crist, A. E. Riley, and K. E. MacLeod. Concentration and Size of Trace Metal Emissions from a Power Plant, a Steel Plant, and a Cotton Gin. Environ. Sci. Technol., 9(7):643-647, 1975.

Lee, S. H. D., I. Johnson, and J. Fischer. Study of the Volatility of Minor and Trace Elements in Illinois Coal. ANL. CEN/FE-77-4, Argonne National Lab., Argonne, Illinois, 1977. 27pp.

Lindberg, S. E., A. W. Andren, R. J. Raridon, and W. Fulkerson. Mass Balance of Trace Elements in Walker Branch Watershed: Relation to Coal-Fired Steam Plants. Environ. Hlth. Persp., 12:9-18, 1975.

Linton, R. W., A. Loh, D. F. S. Natusch, C. A. Evans, Jr., and P. Williams. Surface Predominance of Trace Elements in Airborne Particles. Science, 191(4229):852-854, 1976.

Lyon, W. S. Trace Element Measurements at a Coal-Fired Steam Plant. CRC Press, Cleveland, Ohio, 1977.

Lyon, W. S., and J. F. Emery. Neutron Activation Analysis Applied to the Study of Elements Entering and Leaving a Coal-Fired Steam Plant. Int. J. Environ. Anal. Chem., 4(2):125-133, 1975.

- Lyon, W. S., L. C. Bate, F. F. Dyer, J. S. Eldridge, J. F. Emery, S. A. Reynolds, E. Ricci, J. E. Strain, H. E. Zittel, C. Feldman, and K. J. Northcutt, Trace Element Profiles through a Coal-Fired Steam Plant. In: Analytical Chemistry Division Annual Progress Report, September 1972. Oak Ridge National Lab., Oak Ridge, Tennessee, 1973. pp.30-31.
- MacAdam, W. K. Design and Pollution Control Features of the Saugus, Massachusetts Steam Generating Refuse Energy Plant. Resour. Recovery Conserv., 1(3)235-243, 1976.
- Magee, E. M., H. J. Hall, and G. M. Varga. Potential Pollutants in Fossil Fuels. ESSO Research and Engineering Company, Linden, New Jersey, 1973. 153pp.
- Magee, E. M., H. J. Hall, and G. M. Varga, Jr. Potential Pollutants in Fossil Fuels. EPA-R2-73-249, PB-225 039, ESSO Research and Engineering Co., Linden, New Jersey, 1973. 292pp.
- Magee, R. A., F. B. Meserole, and R. G. Oldham. Coal-Fired Power Plants Trace Element Study, Volume I: A Three-Station Comparison. Radian Corporation, Austin, Texas, 1975.
- Manahan, S. E. Cleaning Coal with Coal: Coal Humic Acids for Removal of Acid, Iron, Heavy Metals, and Organic Pollutants Associated with use of Coal as a Fuel. PB-247 313, Missouri Water Resources Research Center, Columbia, Missouri, 1975. 40pp.
- Marr, H. E., S. L. Law, and D. L. Neylan. Trace Elements in the Combustible Fraction of Urban Refuse, Paper 4-3. In: 3rd International Conference on Environmental Sensing and Assessment, Las Vegas, Nevada, 1975. IEEE, New York, New York, 1976. 6pp.
- Mason, B. Principles of Geochemistry. John Wiley and Sons, Inc., New York, 3rd Edition, 1976. pp.45-46.
- McClendon, L. T. Selective Determination of Chromium in Biological and Environmental Matrixes. Trace Subst. Environ. Health., 8:255-7, 1974.
- Merrill Heit Health and Safety Laboratory. A Review of Current Information on Some Ecological and Health Related Aspects of the Release of Trace Metals into the Environment Associated with the Combustion of Coal. USERDA, 1977.
- Mesich, F. G., and H. L. Taylor. Levels of Trace Elements in the Ambient Air at Selected Locations in the Northern Great Plains. Radian Corp. and Acculabs Research, Austin, Texas, 1976.

Meyers, R. A. Desulfurize Coal Chemically. Hydrocarbon Process., 54(6):93-95, 1975.

Mezey, E. J., S. Singh, and D. W. Hissong. Fuel Contaminants: Volume 2. Removal Technology Evaluation. EPA 600/2-76/177b, PB-260 475, Battelle-Columbus Labs., Columbus, Ohio, 1976. 318pp.

Mezey, E. J., S. Singh, and D. W. Hissong. Fuel Contaminants: Volume I, Chemistry. EPA/600/2-76/177a, PB 256 020, Battelle-Columbus Labs., Columbus, Ohio, 1976. 177pp.

Miller, W. G. Relationships Between Minerals and Selected Trace Elements in Some Pennsylvanian Age Coals of Northwestern Illinois. M.S. Thesis, University of Illinois, Champaign, Urbana, 1974.

Murphy, T. J., and L. J. Moore. National Bureau of Standards. Contract No. 3108747, Washington, D.C., 1977.

Nadkarni, R. A. Multielement Analysis of Coal and Coal Fly Ash Standards by Instrumental Neutron Activation Analysis. Radiochem. Radioanal. Lett., 21(3-4):161-176, 1975.

Natusch, D. F. S. Characterization of Atmospheric Pollutants from Power Plants. In: Second Federal Conference on the Great Lakes, Proceedings, J. S. Marshall, ed. 1975. pp.114-129.

Natusch, D. F. S., C. F. Bauer, H. Matusiewicz, C. A. Evans, J. Baker, A. Loh, R. W. Linton, and P. K. Hopke. Characterization of Trace Elements in Fly Ash. In: International Conference Proceedings on Heavy Metals in the Environment, Volume 2, Part 2, Toronto, Canada, 1975. pp.553-575.

Niessen, W. R., and A. F. Sarofim. Incinerator Air Pollution: Facts and Speculation. In: Proceedings of the National Incinerator Conference, Cincinnati, Ohio, 1970. American Society of Mechanical Engineers, New York, New York, 1970, pp.167-181.

Oglesby, S. Jr., and G. B. Nichols. Introduction to Electrostatic Precipitation (Chapter 1). In: Electrostatic Precipitation. Marcel Dekker, New York, 1978. pp.1-14.

O'Gorman, J. V., and P. L. Walker, Jr. Mineral Matter and Trace Elements in U.S. Coals. R&D Report No. 61, Interim Report No. 2, U.S. Dept. of the Interior, Office of Coal Research, 1972.

O'Gorman, J. V., and P. L. Walker, Jr. Mineral Matter Characteristics of Some American Coals. Fuel, 50(2):135-151, 1971.

Ondov, J. M., R. C. Ragaini, and A. H. Biermann. Characterization of Trace Element Emissions from Coal-Fired Power Plants. Rept. No: CIBF-661962-6, UCRL-80412. In: International Conference on Nuclear Methods in Environmental and Energy Research. Columbia, Missouri, 1977. 21pp.

Ondov, J. M., W. H. Zoller, I. Olmez, et al. Elemental Concentrations in the National Bureau of Standards' Environmental Coal and Fly Ash Standard Reference Materials. Anal. Chem., 47(7):1102-1109, 1975.

Paskin, M. Wood: Rediscovering an Old Fuel. People Ener., 2(8):2-3, 1976.

Pennsylvania State University, Coal Research Section. Coal Data Base Processor, Version 6.0: March 1978. University Park, Pennsylvania, 1978.

Peterson, M. N., and J. B. Zink. A Semiquantative Spectrochemical Method for Analysis of Coal Ash. U.S. Bureau of Mines Report of Inv. 64%, 1964. pp.8-10.

Phillips, M. A. Investigations into Levels of Both Airborne Beryllium and Beryllium in Coal at the Hayden Power Plant near Hayden, Colorado. Environ. Lett., 5(3):183-188, 1973.

Pollock, E. N. Trace Impurities In Coal by Wet Chemical Methods. Adv. Chem. Ser., 141,23-34, 1975.

Pollock, E. N. Trace Impurities in Coal. Am. Chem. Soc. Div. Fuel Chem. Prepr., 18(4):92-105, 1973.

Ragaini, R. C., and J. M. Ondov. Trace Contaminants from Coal-Fired Power Plants. Presented at the International Conference on Environmental Sensing and Assessment, Las Vegas, Nevada.

Ragaini, R. C., and J. M. Ondov. Trace-Element Emissions from Western U.S. Coal-Fired Power Plants. CONF-760915-4, UCRL-77669 (Rev. 1). Presented at the Modern Trend in Activation Analysis Meeting, Munich, Germany, 1976. 11pp.

Rancitelli, L. A. Inorganic Emissions from the Hanford Steam Plant. BNWL-1551, Part 2. In: Pacific Northwest Lab. Annual Report for 1970 to the USAEC Division of Biology and Medicine, Volume 2. Battelle Memorial Institute, Richland, Washington, 1971. pp.37-38.

Rancitelli, L. A. Neutron Activation Analysis of Coal and Fly Ash Standards. BNWL-1752, PT2, Battelle-Pacific Northwest Laboratories, Richland, Washington, 1973. pp.56-57.

Rancitelli, L. A. Neutron Activation Analysis of Coal and Fly Ash Standards. In: Pacific Northwest Laboratory. Annual Report for 1972 to the USAEC Division of Biomedical and Environmental Research. Volume II. Physical Sciences. Part 2. Radiological Sciences. Battelle Memorial Inst., Richland, Washington, Pacific Northwest Labs., 1973. pp.56-57.

Ray, S. S., and F. G. Parker. Characterization of Ash from Coal-Fired Power Plants. PB-265 374, EPA 600/7-77-010, Tennessee Valley Authority, Chattanooga, Tennessee, 1977. 142pp.

Rubin, E. S. A Systematic Approach to Characterizing Energy-Environment Tradeoffs for Coal Utilization Technologies. In: Energy and the Environment, Proceedings of the Fifth National Conference, Cincinnati, Ohio, 1977, D. G. Nichols, et al., eds. AIChE, Dayton, Ohio, 1978. pp.124-131.

Ruch, R. R., H. J. Gluskoter, and E. J. Kennedy. Mercury Content of Illinois Coals. Illinois Geological Survey Environmental Geology, Note 43. 15p.

Ruch, R. R., H. J. Gluskoter, and N. F. Shimp. Occurrence and Distribution of Potentially Volatile Trace Elements in Coal. EPA/650/2-74-054, PB-238 091, Illinois State Geological Survey, Urbana, Illinois, 1974. 94pp.

Ruch, R. R., H. J. Gluskoter, and N. F. Shimp. Occurrence and Distribution of Potentially Volatile Trace Elements in Coal. Ill. Environ. Geol. Notes. (72), 1974.

Ruch, R. R., H. J. Gluskoter, and N. F. Shimp. Distribution of Trace Elements in Coal. Environ. Prot. Technol. Ser., :49-53, 1974.

Schlesinger, M. D., and H. Schultz. Analysis for Mercury in Coal. PB-204 152, U.S. Bureau of Mines, Pittsburgh, Pennsylvania, 1971. 8pp.

Schultz, H., E. A. Hattman, and W. B. Booher. Fate of Some Trace Elements During Coal Pretreatment and Combustion. Am. Chem. Soc. Div. Fuel Chem. Prepr., 18(4):108-113, 1973.

Schultz, H., E. A. Hattman, and W. B. Booher. Fate of Some Trace Elements During Coal Pretreatment and Combustion. Adv. Chem. Ser., 141:139-153, 1975.

Schwitzgebel, K., F. B. Meserole, R. G. Oldham, R. A. Magee, F. G. Mesich, and T. L. Thoem. Trace Element Discharge from Coal-Fired Power Plants. In: 1st International Conference on Heavy Metals in the Environment, Symposium Proceedings, Volume 2. University of Toronto, Toronto, Ontario, 1975. pp.533-551.

Sharkey, A. G. Jr., T. Kessler, and R. A. Friedel. Trace Elements in Coal Dust by Spark Source Mass Spectrometry. Adv. Chem. Ser., 141:48-56, 1975.

Sheibley, D. W. Trace Element Analysis of Coal by Neutron Activation. N73-21596, NASA, Cleveland, Ohio, 1973. 15pp.

Sheibley, D. W. Trace Element Analysis of Coal By Neutron Activation. Am. Chem. Soc. Div. Fuel Chem. Prepr., 18(4):59-71, 1973.

Sheibley, D. W. Trace Elements by Instrumental Neutron Activation Analysis for Pollution Monitoring. Adv. Chem. Ser., 141:98-117, 1975.

Stambaugh, E. P., R. D. Giammer, E. L. Merryman, E. L. Merryman, J. S. McNulty, and K. C. Sekhar. Combustion of Hydorthermally Treated Coals. Battelle Memorial Institute, Columbus, Ohio, 1977.

Suhr, N. H., and H. Gong. Comparison of Atomic Absorption and D. C. Plasma-Arc Spectrometry in Multi-Element Analysis of Coal. Am. Chem. Soc. Div. Fuel Chem. Prepr., 22(5):56-59, 1977.

Sun, S. C., H. Vasques-Rosas, and D. Augenstein. Pennsylvania Anthracite Refuse: A Literature Survey on Chemical Elements in Coal and Coal Refuse. SR-83, Pennsylvania State University College of Earth and Mineral Sciences Special Report of Research, 1971.

Toca, F. M., C. M. Cheever, and C. L. Berry. Lead and Cadmium Distribution in the Particulate Effluent from a Coal-Fired Boiler. Amer. Ind. Hyg. Assoc. J., 34(9):396-403, 1973.

U.S. Bureau of Mines. Minerals Yearbook, 1975, Volume I, Metals, Minerals, and Fuels. G.P.O., Washington, D.C., 1977.

U.S. Comptroller General. U.S. Coal Development--Promises, Uncertainties, Report to the Congress. General Accounting Office, Washington, D.C., 1977.

U.S. Environmental Protection Agency. Third Report to Congress: Resource Recovery and Waste Reduction. EPA-SW-161, 1975. 96.pp.

Union Carbide Corp., eds. Memorandum on the Status of Air Pollution Abatement at Marietta, Ohio. In: Economic Dislocation Resulting from Environmental Controls. 92nd Congress (Senate), First Session, 1971. pp.139-146.

von Lehmden, D. J., P. D. LaFleur, and G. G. Akland. Interlaboratory Evaluation of Standard Reference Materials for Trace Elements in Coal, Fly Ash, Fuel Oil, and Gasoline. Am. Chem. Soc. Div. Fuel. Chem. Prepr., 18(4):107, 1973.

von Lehmden, D. J., R. E. Lee, Jr., and R. H. Jungers. Trace Elements in Coal, Oil, Gas, Compare Analyt. Meth. Anal. Chem., 46(2):239, 1974.

Wagenet, R. J., W. J. Grenney, and J. J. Jurinak. Environmental Transport Model of Heavy Metals. ASCE J. Environ. Eng. Div., 104(1):61-76, 1978.

Walker, P. L. Jr., et al. Characterization of Mineral Matter in Coals and Coal Liquefaction Residues. Pennsylvania State University, University Park, Pennsylvania, 1977.

Walker, P. L. Jr., N. C. Gardner, P. H. Given, H. J. Gluskoter, and J. L. Johnson. Catalysis of Coal Conversion Processes and Characterization of Mineral Matter and Trace Elements in Coal. EPRI-207-0-0. In: Research and Development Programs for Catalysis in Coal Conversion Processes. Electric Power Research Institute, 1974. pp. A86-A169.

Wangen, L. E., and C. L. Wienke. Review of Trace Element Studies Related to Coal Composition in the Four Corners Area of New Mexico. LA-6401-MS, Los Alamos Scientific Laboratory, Los Alamos, New Mexico, 1976. 56pp.

Wedge, W. K., D. M. S. Bhatia, and A. W. Reuff. Chemical Analyses of Selected Missouri Coals and Some Statistical Implication. RI-60, PB-268 086, Missouri Dept. of Natural Resources, Jefferson City, Missouri, 1976. 42pp.

Wewerka, E. M., J. M. Williams, and P. L. Wanek. Assessment and Control of Environmental Contamination from Trace Elements in Coal Processing Wastes. CONF-760208-1, LA04-76-86, Los Alamos Scientific Lab., New Mexico, 1976. 7pp.

Wewerka, E. M., J. M. Williams, N. E. Vanderbough, A. W. Harmon, and P. Wagner. Trace Element Characterization of Coal Wastes. EPA 600/7-78-028a, University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico, 1978.

Wewerka, E. M., J. M. Williams, P. O. Wanek, and J. D. Olsen. Environmental Contamination from Trace Elements in Coal Preparation Wastes. A Literature Review and Assessment. EPA-600/7-76-007, PB-267 339, Los Alamos Scientific Lab., New Mexico, 1976. 69pp.

Wewerka, J. M., et al. Trace Contaminants from Coal Preparation Wastes. In: Trace Contaminants from Coal, S. Torrey, ed. Noyes Data Corp., Park Ridge, New Jersey, 1978. pp.229-284.

Williams, J. J., E. M. Wewerka, and N. E. Vanderborgh. Environmental Pollution by Trace Elements in Coal Preparation Wastes. In: Papers from the Symposium on Coal Mine Drainage Research, 1977. National Coal Association, Washington, D.C., 1977. pp.51-60.

Williams, J. M., E. M. Wewerka, N. E. Vanderborgh, P. Wagner, P. L. Wanek, and J. D. Olsen. Environmental Pollution by Trace Elements in Coal Preparation Wastes. LA-UR-77-1850, Los Alamos Laboratories, Los Alamos, New Mexico, 1977. 11pp.

Yen, T. F. Chemical Aspects of Metals in Native Petroleum. In: Yen, T.F. The Role of Trace Metals in Petroleum. Ann Arbor Science, Ann Arbor, Michigan, 1975. pp.1-30.

Yen, T. F. Preprints, Division of Petroleum Chemistry. ACS, 17(4):F120, 1972.

Yen, T. F. The Role of Trace Metals in Petroleum. Ann Arbor Science, Ann Arbor, California, 1975.

Zimmerman, N., et al. Characterization and Generation of Metal Aerosols. Industrial Environmental Research Lab., Research Triangle Park, North Carolina, 1978.

Zoller, W. H. Photon Activation Analysis. In: 2nd Joint Conference Proceedings on the Sensing of Environmental Pollutants, 1973. Instrument Society of America, Pittsburgh, Pennsylvania, 1973. pp. 185-189.

Zubovic, P. Physiochemical Properties of Certain Minor Elements as Controlling Factors of Their Distribution in Coal. Advan. Chem. Ser., 55:221-246, 1966.

Zubovic, P., T. Stadnichenko, and N. B. Sheffey. Distribution of Minor Elements in Coal Beds of the Eastern Interior Region. U.S. Geol. Surv. Bull., 1117-B, 1964.

Zubovic, P., T. Stadnichenko, and N. B. Sheffey. The Association of Minor Elements with Organic and Inorganic Phases of Coal. U.S. Geol. Surv. Prof. Pap., 400-B:B85-B87, 1960.

Zubovic, P., T. Stadnichenko, and N. B. Sheffey. Chemical Bases of Minor Element Associations in Coal and Other Carbonaceous Sediments. U.S. Geol. Surv. Prof. Pap., 424-D:D345-D348, 1961.

COMBUSTION AND CONTROL TECHNOLOGIES

- Brady, J. D., and L. K. Legatski. Venturi Scrubbers. In: Air Pollution Control Design Handbook, Part 2. Marcel Dekker, New York, 1977. pp.747-777.
- Campbell, J. A., J. C. Laul, K. K. Nielson, and R. D. Smith. Separation and Chemical Characterization of Finely-Sized Fly-Ash Particles. Anal. Chem., 50(8):1032-1040, 1978.
- Cartrell, F. E. Control of Air Pollution from Large Thermal Power Stations. Presented at the Symposium on Air Pollution Control, Essen, Germany, 1966 and at the Belgian Royal Society of the Engineers and Industrialists, Brussels, Belgium, 1966.
- Changnon, S. A. The LaPorte Weather Anomaly--Fact or Fiction. Bull. Am. Meteorol. Soc., 49(1):4-11, 1968.
- Cheremisinoff, P. N. Control of Fine Particulate Air Pollutants: Equipment Update Report. Pollut. Eng., (8):22, 1976.
- Cleaning Coal by Solvent Refining. Environ. Sci. Technol, 8(6):510-511, 1974.
- Coleman, W. M., W. M. Szabo, D. L. Wooten, H. C. Dorn, and L. T. Taylor. Minor and Trace Metal Analysis of a Solvent-Refined Coal by Flameless Atomic Absorption. Fuel, 56(2):195-198, 1977.
- Cooper, D. W., R. Wang, and D. P. Anderson. Evaluation of Eight Novel Fine Particle Collection Devices. EPA 600/2-76-035, PB-251 621, GCA Corp., Bedford, Massachusetts, 1976. 192pp.
- Covey, J. N., and J. H. Faber. Ash Utilization-Views on the Growth Industry. In: Proceedings of the 3rd Mineral Waste Utilization Symposium, Chicago, Illinois, 1972. Bureau of Mines, Washington, D.C., 1972. pp.27-34.
- Cross, F. L. Jr., and R. W. Ross. Effluent Water From Incinerator Flue-Gas Scrubbers. In: Proceedings of the National Incinerator Conference, New York, 1968. American Society of Mechanical Engineers, New York, New York, 1968. pp.69-72.

Davison, R. L., D. F. S. Natusch, J. R. Wallace, and C. A. Evans, Jr. Trace Elements in Fly Ash. Dependence of Concentration on Particle Size. Environ. Sci. Technol., 8(13):1107-13, 1974.

Devitt, T. W., C. J. Sawyer, and F. D. Hall. State-of-the-Art Assessment of Air Pollution Control Technologies for Various Waste-as-Fuel Processes. In: Energy and the Environment, Proceedings of the Fifth National Conference, Cincinnati, Ohio, 1977, D. G. Nichols, et al., eds. AIChE, Dayton, Ohio, 1978. pp.167-173.

Economic Indicators. Chem. Eng., 86(1):7, 1979.

Ensor, D. S., R. G. Hooper, and R. W. Scheck. Determination of the Fractional Efficiency, Opacity Characteristics, Engineering and Economic Aspects of a Fabric Filter Operating on a Utility Boiler. EPRI/FP-297, PB-261 472, Meteorology Research, Inc., Altadena, California, 1976. 206pp.

Fancher, J. R. Trace Element Emissions from the Combustion of Fossil Fuels. In: Proceedings of the Environmental Resources Conference, Cycling Contributions of Metals, 1972. National Environmental Research Center, Cincinnati, Ohio, 1973. pp.109-113.

Farber, P. S. Capital and Operating Costs of Particulate Control Equipment for Coal-Fired Power Plants. In: Energy and the Environment, Proceedings of the Fifth National Conference, Cincinnati, Ohio, 1977, D. G. Nichols, et al., eds. AIChE, Dayton, Ohio, 1978. pp.434-440.

Fennelly, P. F., et al. Coal Burns Cleaner in a Fluid Bed. Environ. Sci. Technol., 11(3):244-248, 1977.

Fly Ash By Products Grow in Value. Elect. World, 182(4)42, 1974.

Ford, C. T. Coal Cleaning to Remove Trace Elements Prior to Utilization. Pap. Symp. Coal. Util., 4:146-191, 1977.

Fuchs, M. R., and G. M. Crawford. Trace Elements Characterization of Unit No. 5 and the Horizontal Scrubber at the Four Corners Generating Station. Radian Corp., Austin, Texas, 1977.

Furr, A. K., T. F. Parkinson, R. A. Hinrichs, D. R. van Campen, C. A. Bache, W. H. Gutenmann, and L. E. St. John. National Survey of Elements and Radioactivity in Flyashes: Absorption of Elements by Cabbage Grown in Flyash-Soil Mixtures. Environ. Sci. Technol., 11(13):1194, 1977.

Gambs, G. C. Power Plant Ash--A Neglected Asset. Min. Eng., 19(1):42-44, 1967.

Gladney, E. S., and J. W. Owens. Beryllium Emissions from a Coal-Fired Power Plant. Environ. Sci. Health, Environ. Sci. Eng., 11(4-5):297-312, 1976.

Goldstein, H. L., and C. W. Siegmund. Influence of Heavy Fuel Oil Composition and Boiler Combustion Conditions on Particulate Emissions. Environ. Sci. Technol., 10(12):1109-1114, 1976.

Gunn, R. The Secular Increase of the World-Wide Fine Particle Pollution. J. Atmos. Sci., 21:168-181, 1964.

Hart, F. C., and B. T. DeLaney. The Impact of RCRA (PL 94-580) on Utility Solid Wastes. EPRI FP-878, EPRI TPS 78-779, Fred C. Hart Associates, Inc., New York, 1978.

Hatch, T. F., and P. Gross. Pulmonary Deposition and Retention of Inhaled Aerosols. Academic Press, New York, New York, 1964.

Henke, W. G. The New "Hot" Electrostatic Precipitator. Combustion, 42(4):50-53, 1970.

Hobbs, P. V., L. F. Radke, and S. E. Shumway. Cloud Condensation Nuclei from Industrial Sources and Their Apparent Influence on Precipitation in Washington State. J. Atmos. Sci., 27:81-89, 1970.

Hobson, M. J. Review of Baghouses Systems for Boiler Plants. APCA J., 26(1):22-26, 1976.

Holland, W. F., K. A. Wilde, J. L. Parr, P. S. Lowell, and R. F. Pohler. Environmental Effects of Trace Elements from Pondered Ash and Scrubber Sludge. PB-252 090, Radian Corp., Austin, Texas, 1975. 403pp.

Janoso, R. P., and J. A. Meyler. Baghouse Operating Experience with Coal Firing. Power Eng., 80(10):62-64, 1976.

Kaakinen, J. W., R. M. Jorden, M. H. Lawasani, and R. E. West. Trace Element Behavior in Coal Fired Power Plant. Environ. Sci. Technol., 9(9):862-869, 1975.

Katell, S. The Potential Economics of the Recovery of Trace Elements in Coal Refuse. Rept. 142, West Virginia University, 1977.

Klein, D. H., A. W. Andren, J. A. Carter, et al. Pathways of Thirty-Seven Trace Elements through Coal Fired Power Plant. Environ. Sci. Technol., 9(10):973-979, 1975.

Lee, R. E. Jr., and D. J. von Lehmden. Trace Metal Pollution in the Environment. APCA J., 23(10):853-857, 1973.

Lee, R. E. Jr., H. L. Crist, A. E. Riley, and K. E. MacLeod. Concentration and Size of Trace Metal Emissions from a Power Plant, a Steel Plant, and a Cotton Gin. *Environ. Sci. Technol.*, 9(7):643-647, 1975.

Linton, R. W., A. Loh, D. F. S. Natusch, C. A. Evans, Jr., and P. Williams. Surface Predominance of Trace Elements in Airborne Particles. *Science*, 191(4229):852-854, 1976.

Lowry, H. H. ed. *Chemistry of Coal Utilization*, 2 Volumes and Supplement. Wiley, New York, New York, 1945, 1963.

Lyon, W. S., and J. F. Emery. Neutron Activation Analysis Applied to the Study of Elements Entering and Leaving a Coal-Fired Steam Plant. *Int. J. Environ. Anal. Chem.*, 4(2):125-133, 1975.

Mace, G. R. Treatment of Liquid Wastes in the Power Industry, Paper 7. In: *Proceedings of the 8th Annual Front of Power Technology Conference*, Stillwater, Oklahoma, 1975. Oklahoma State University, Engineering Extension, Stillwater, Oklahoma, 1975. 13pp.

Mann, R. M., R. A. Magee, R. V. Collins, M. P. Fuchs, and F. G. Mesich. Trace Element Study of Fly Ash: Emissions from Coal-Fired Steam Plants Equipped with Hot-Side and Cold-Side Electrostatic Precipitation for Particulate Removal. EPA 908/4-78-008. Radian Corp., Austin, Texas, 1978.

Miller, B., G. Lamb, P. Constanza, and J. Craig. Nonwoven Fabric Filters for Particulate Removal in Respirable Dust Range. EPA 600/7-77-115, PB-273 359, Textile Research Institute, Princeton, New Jersey, 1977. 65pp.

Mills, R. A., and O. J. Tassicker. Analysis of Pilot Plant Electrostatic Precipitator Testing in Connection with Huntly Power Station. In: *Proceedings of the 1975 Clean Air Conference*, Volume 1, Ann Arbor Science Publishers, Ann Arbor, Michigan, 1975. pp.66-91.

Morrow, P. E. *Amer. Ind. Hyg. Assoc. J.*, 25:213-236, 1964.

Natusch, D. F. S., C. F. Bauer, H. Matusiewicz, C. A. Evans, J. Baker, A. Loh, R. W. Linton, and P. K. Hopke. Characterization of Trace Elements in Fly Ash. In: *International Conference Proceedings on Heavy Metals in the Environment*, Volume 2, Part 2, Toronto, Canada, 1975. pp.553-575.

Nichols, D. G., E. J. Rolinski, R. A. Servais, L. Theodore, and A. J. Buonicore, eds. *Energy and the Environment*, Proceedings of the Fifth National Conference, Cincinnati, Ohio, October 31-November 3, 1977. AIChE, Dayton, Ohio, 1978.

Noe, N. D., and J. M. Bruck. Particulate Control for Coal-Fired Industrial Boilers. In: Energy and the Environment, Proceedings of the Fifth National Conference, Cincinnati, Ohio, 1977, D. G. Nichols, et al., eds. AIChE, Dayton, Ohio, 1978. pp. 428-433.

Oglesby, S. Jr., and G. B. Nichols. Introduction to Electrostatic Precipitation (Chapter 1). In: Electrostatic Precipitation. Marcell Dekker, New York, 1978. pp.1-14.

Ondov, J. M., R. C. Ragaini, A. H. Biermann, C. E. Choquette, G. E. Gordon, and W. H. Zoller. Elemental Emissions from a Western Coal-Fired Power Plant: Preliminary Report on Concurrent Plume and In-Stack Sampling. UCRL-78825, Presented at the American Chemical Society, Div. of Environmental Chemistry Meeting, New Orleans, Louisiana, 1977.

Ondov, J. M., R. C. Ragaini, and A. H. Biermann. Characterization of Trace Element Emissions from Coal-Fired Power Plants. Rept. No: CIBF-661962-6, UCRL-80412. In: International Conference on Nuclear Methods in Environmental and Energy Research. Columbia, Missouri, 1977. 21pp.

Ondov, J. M., R. C. Ragaini, and A. H. Biermann. Elemental Emissions from A Coal-Fired Power Plant: Comparison of a Venturi Wet Scrubber System with a Cold-Side Electrostatic Precipitator. UCRL-80110, Lawrence Livermore Laboratory, Livermore, California, 1977.

Ondov, J. M., R. C. Ragaini, and A. H. Biermann. Evaluation of Two Particulate Collection Alternatives for Trace Element Removal at Coal-Fired Power Plants. Paper No. 78-34.6, Presented at the APCA 71st Annual Meeting, Houston, Texas, 1978.

Paulson, C. A. J., and A. R. Ramsden. Some Microscopic Features of Fly-Ash Particles and Their Significance in Relation to Electrostatic Precipitation. Atmos. Environ., 4(2):175-185, 1970.

Peters, J. M. Predicting Efficiency of Fine-Particle Collectors. Chem. Eng., (April):99, 1973.

Radian Corp. Pollution Control Technology for Fossil Fuel-Fired Electric Generating Stations. Austin, Texas, 1975.

Radian Corp., Austin, Texas. Coal Fired Power Plant Trace Element Study. 4 Volumes. A Three Station Comparison. PB-257 293, Austin, Texas, 1975. 87pp.

Reigel, S. A., and R. P. Bundy. Why the Swing to Baghouse? Power, 121(1):68-73, 1977.

Rossoff, J., and R. C. Rossi. Disposal of By-Products from Non-Regenerable Flue Gas Desulfurization Systems: Initial Report. EPA/650/2-74-037a, PB-237 114, Aerospace Corp., El Segundo, California, 1974. 318pp.

Sargent, G. D. Dust Collection Equipment. Chem. Eng., 76(2):130-150, 1969.

Schaefer, V. J. The Inadvertent Modification of the Atmosphere by Air Pollution. Bull. Am. Meteorol. Soc., 50(4):199-206, 1969.

Schmitt, C. R. Survey of the Fly - Ash Disposal System at the Oak Ridge Y-12 Plant. Oak Ridge, Tennessee, 1970.

Schulz, E. J., R. B. Engdahl, and T. T. Frankenberg. Submicron Particles from a Pulverized Coal Fired Boiler. Atmos. Environ., 9(1):111-119, 1975.

Schwieger, B. Optimizing Efficiency, Reliability and Cost in Plant Design and Construction. Power, 122(11):S2-S14, 1978.

Seale, L. M. Proceedings: Symposium on the Use of Fabric Filters for the Control of Submicron Particulates. (April 8-10, 1974, Boston, Massachusetts). EPA 650/2-74-043, PB 237 629, GCA, Corporation, Bedford, Massachusetts, 1974. 306pp.

Shannon, L. J. Control Technology for Fine Particulate Emissions. EPA-650/2-74-027, Midwest Research Inst., Kansas City, Missouri, 1974.

Shannon, L. J., and M. P. Schrag. Environmental Impact of Waste-to-Energy Systems. In: Energy and the Environment, Proceedings of the Fourth National Conference, Cincinnati, Ohio, 1976. AIChE, Dayton and Ohio Valley Section, APCA, Pittsburg, Pennsylvania, 1976. pp.187-193.

Shannon, L. J., and P. G. Gorman. Particulate Pollutant System Study. Volume II - Fine Particle Emissions. PB-203 521, Midwest Research Institute, 1971. 335pp.

Sheibley, D. W. Trace Elements by Instrumental Neutron Activation Analysis for Pollution Monitoring. Adv. Chem. Ser., 141:98-117, 1975.

Smith, M. F. Fly Ash. National Technical Information Service, Springfield, Virginia, 1975.

Smith, M. F. Fly Ash. Volume 3. November, 1977-September, 1978 (Citations from the Engineering Index Data Base). NTIS/PS-78/1072, NTIS, Springfield, Virginia, 1978. 139pp.

Smith, R. D., J. A. Campbell, and K. K. Nielson. Mechanisms for Trace Element Enrichment in Fly Ash During Coal Combustion. Am. Chem. Soc. Div. Fuel Chem. Prepr., 23(1):196-205, 1978.

Stephens, N. T., A. K. Furr, C. R. Thompson, and R. L. Carter. Trace Metals in Effluents from Coal-Fired Furnaces. In: Proceedings of the 4th Annual Environmental Engineering and Science Conference, Louisville, Kentucky, 1974. pp.701, 703-717.

Swift, W. M., G. J. Vogel, and A. F. Panek. Potential of Fluidized-Bed Combustion for Reducing Trace-Element Emissions. CONF-730616-4, Argonne National Lab., Argonne, Illinois, 1975. 20pp.

Switch Back to Coal Puts Renewed Emphasis on Particulate Removal. Power, 119(11):41-48, 1975.

The State of the Art of Municipal Incinerators. In: Pollution Control and Technology, M. Fogiel, ed. Research and Education Association, New York, New York, 1973. pp.530-558.

Theis, T. L. Contamination of Groundwater by Heavy Metals from the Land Disposal of Fly Ash. Notre Dame University, Purdue, Indiana.

Thoem, T. L. Coal Fired Power Plant Trace Element Study. Energy Environ., 5:223-229, 1978.

Thompson, W. H. Control of Particulates in Power Generation. In: Proceedings of the 1st Annual Proceedings on Industrial Air Pollution Control Conference, Knoxville, Tennessee, 1971. pp.72-93.

Torrey, S., ed. Trace Contaminants from Coal. Noyes Data Corp., Park Ridge, New Jersey, 1978.

U.S. Environmental Protection Agency, Office of Air and Water Programs, Effluent Guidelines Div. Development Document for Proposed Effluent Limitations Guidelines and New Source Performance Standards for the Steam Electric Power Generating Point Source Category. 1974.

U.S. Environmental Protection Agency, Office of Water Program Operations. Municipal Sludge Management: Environmental Factors. EPA 430/9-77-004, Washington, D.C., 1977.

U.S. National Air Pollution Control Boards. Air Quality Criteria for Particulate Matter. AP-49, Washington, D.C., 1969.

Vandegrift, A. E., and L. J. Shannon. Particulate Pollutant System Study, Volume II Handbook of Emission Properties. PB-203 522, Midwest Research Institute, 1971. 607pp.

Vandegrift, A. E., L. J. Shannon, and P. G. Gorman. Controlling Fine Particles. Chem. Eng., 80(141):107, 1973.

Venditti, F. P., J. A. Armstrong, and M. Durham. Symposium on the Transfer and Utilization of Particulate Control Technology: Volume 2. Fabric Filters and Current Trends in Control Equipment. EPA 600/7-79-004b, Denver Research Institute, Denver, Colorado. 1979, 405pp.

Wewerka, E. M., J. M. Williams, and P. L. Wanek. Assessment and Control of Environmental Contamination from Trace Elements in Coal Processing Wastes. CONF-760208-1, LA04-76-86, Los Alamos Scientific Lab., New Mexico, 1976. 7pp.

Whitby, K. T., and W. E. Clark. Electric Aerosol Particle Counting and Size Distribution Measuring System for the 0.15 μ to 1 μ Size Range. Tellus, 18:573-586, 1966.

Wright, J. H., and H. K. Roffman. Coal Ash--A Potential Mineral Source. In: Proceedings, Environment and Technology, 1976, Philadelphia, Pennsylvania, 1976. Institute of Environment and Science, Mount Prospect, Illinois, 1976. pp.163-173.

Yeh, J. T., C. R. McCann, J. J. Demeter, and D. Bienstock. Removal of Toxic Trace Elements from Coal Combustion Effluent Gas. PERC/R1-76/5 Energy Research and Development Administration, Pittsburgh, Pennsylvania, 1976. 21pp.

EMISSIONS

Abel, K. H., and L. A. Rancitelli. Major, Minor, and Trace Element Composition of Coal and Fly Ash, as Determined by Instrumental Neutron Activation Analysis. Adv. Chem. Ser., 141:118-38, 1975.

Abernethy, R. F., M. J. Peterson, and F. H. Gibson. Spectrochemical Analyses of Coal Ash for Trace Elements. RI-7281, U. S. Bureau of Mines, Washington, D. C., 1969. 34 pp.

Alberts, J. J., et al. Relative Availability of Selected Trace Elements from Coal Fly Ash and Lake Michigan Sediment. CONF-771072-7. Presented at the International Conference on Nuclear Methods in Environmental and Energy Research, Columbus, Missouri, 1977.

Anderson, D. Emission Factors for Trace Substances. EPA 450/2-73-001, PB 230 894/AS, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1973. 82pp.

Anderson, W. L., and K. E. Smith. Dynamics of Mercury at Coal-Fired Power Plant and Adjacent Cooling Lake. Environ. Sci. Technol., 11(1):75-80, 1977.

Andren, A. W., D. H. Klein, and Y. Talmi. Selenium in Coal Fired Steam Plant Emissions. Environ. Sci. Technol., 9(9):856-858, 1975.

Andren, A. W., N. E. Bolton, and D. H. Klein. Trace Element Discharges from Coal Combustion for Power Production. Water, Air, and Soil Pollut., 5(1):71-77, 1975.

Andren, A., et al. Physical and Chemical Characterization of Selenium in Coal Fired Steam Plant Emissions. CONF-740836--1. Presented at the 2nd Annual NSF-RANN Trace Contaminants Conference, 1974.

Anit, W. U., R. G. Senechal, and W. E. Erlebach. Isotopic Composition as a Natural Tracer of Lead in the Environment. Environ. Sci. Technol., 4(4):305-317, 1970.

Argonne National Labs., Preliminary Assessment of the Health and Environmental Effects of Coal Utilization in the Scenarios Technology Characterizations, Air and Water Resource Impacts, and Health Effects. ANL-77-xx-40 (Vol. 1), Argonne, Illinois, 1977.

Barrett, R. E., D. W. Locklin, and S. E. Miller. Investigation of Particulate Emissions from Oil-Fired Residential Heating Units. EPA 650/2-74, Battelle-Columbus Laboratories, Columbus, Ohio, 1974.

Battelle Columbus Laboratories. Trace Elements in Combustion Systems. EPRI RP-122, Columbus, Ohio, 1974.

Bennett, R. L. and K. L. Knapp. Chemical Characteristics of Particulate Emissions from Oil-Fired Power Plants. Presented at the 4th National Conference on the Environment, Cincinnati, Ohio, 1976. 6pp.

Bennett, R. L., and K. L. Knapp. Chemical Characteristics of Particulate Emissions from Oil-Fired Power Plants. Presented at the National Conference on the Environment, 4th, Cincinnati, Ohio, 1976.

Bethell, F. V. Br. Coal Util. Res. Assoc. Mon Bull, 26(12), 401-30(1962).

Billings, C. E., and W. R. Matson. Mercury Emissions from Coal Combustion. Science, 176:1232-1233, 1972.

Block, C., and R. Dams. Lead Contents of Coal, Coal Ash and Fly Ash. Water Air Soil Pollut., 5(2):207-211, 1975.

Block, C., and R. Dams. Study of Fly Ash Emission During Combustion of Coal. Environ. Sci. Technol., 10(10):1011-1017, 1976.

Bolton, N. E., J. A. Carter, J. F. Emery, C. Feldman, and W. Fulkerson. Trace Element Mass Balance Around a Coal-Fired Steam Plant. Am. Chem. Soc. Div. Fuel Chem. Prepr., 18(4):114-23, 1973.

Bolton, N. E., J. A. Carter, J. F. Emery, C. Feldman, and W. Fulkerson. Trace Element Mass Balance Around a Coal-Fired Steam Plant. Oak Ridge National Laboratories, Oak Ridge, Tennessee, 1973.

Bolton, N. E., J. A. Carter, J. F. Emery, et al. Trace Element Mass Balance Around a Coal-Fired Steam Plant. Adv. Chem. Ser., (141):175-187, 1975.

Bolton, N. E., W. Fulkerson, R. I. Van Hook, W. S. Lyon, and A. W. Andren. Trace Element Measurements at the Coal-Fired Allen Steam Plant. Progress Report, February 1973--July 1973. Oak Ridge National Laboratories, Oak Ridge, Tennessee.

Bolton, N., R. Van Hook, W. Fulkerson, W. Lyon, and A. Andren. Trace Element Measurements at the Coal-Fired Allen Steam Plant. Progress Report, June 1971-January 1973. Oak Ridge National Laboratories, Oak Ridge, Tennessee.

- Bornstein, L. J., R. B. Fling, F. D. Hess, R. C. Rossi, and J. Rossoff. Re-Use of Power Plant Desulfurization Waste Water. EPA 600/2-76-024, Environmental Protection Agency, Corvallis, Oregon, 1976.
- Boulding, R. What is Pure Coal? *Environment*, 18(1):12-17,35-36, 1976.
- Boyer, J. F., and V. F. Gleason. Industrial Wastes. Coal and Coal Mine Drainage. *J. Water Pollut. Control Fed.*, 46(6):1290-1294, 1974.
- Brown, O. D. Energy Generation from Wood Wastes. Presented at the International District Heating Association Meeting, French Lick, Indiana, 1973.
- Cahill, R. A., J. K. Kuhn, G. B. Dreher, R. R. Ruch, H. J. Gluskoter, and W. G. Miller. Occurrence and Distribution of Trace Elements in Coal. *Am. Chem. Soc. Div. Fuel Chem. Prepr.*, 21(7):90-103, 1976.
- Cahill, T. A., D. S. Ensor, and L. E. Sparks. Elemental Analysis of Fly Ash from Combustion of a Low Sulfur Coal. Presented at the 68th APCA Annual Meeting and Exhibition, 1975.
- Cairney, T., and R. C. Frost. A Case Study of Mine Water Quality Deterioration, Mainsforth Colliery, County Durham. *J. Hydrol.*, 25(3-4):275-293, 1975.
- Campbell, J. A., J. C. Laul, K. K. Nielson, and R. D. Smith. Separation and Chemical Characterization of Finely-Sized Fly-Ash Particles. *Anal. Chem.*, 50(8):1032-1040, 1978.
- Campbell, W. J. Metals in the Wastes we Burn? *Environ. Sci. Technol.*, 10(5):436-439, 1976.
- Carter, J. A., R. L. Walker, and J. R. Sites. Trace Impurities in Fuels by Isotope Dilution Mass Spectrometry. *Am. Chem. Soc. Div. Fuel Chem. Prepr.*, 18(4):78-91, 1973.
- Cato, G. A. and R. A. Venezia. Trace Element and Organic Emissions from Industrial Boilers, Paper 76-27. In: *Proceedings of the 69th Annual APCA Meeting, Portland, Oregon, Volume 3, 1976.* 15pp.
- Cherry, D. S., and R. K. Guthrie. Toxic Metals in Surface Waters from Coal Ash. *Water Resources Pt. B*, 13(6):1227, 1977.
- Cho, P. and J. H. Chambers. Municipal Refuse: An Alternate Energy Resource in Power Plants. In: *Energy and the Environment, National Conference Proceedings, Cincinnati, Ohio, 1976.* pp. 204-211.

Chu, T. J., P. A. Krenkel, and R. J. Ruane. Characterization and Reuse of Ash Pond Effluents in Coal-Fired Power Plants. Presented at the 49th Annual Water Pollution Control Federation Conference, Minneapolis, Minnesota, October 1976.

Chu, T. J., R. J. Ruane, and G. R. Steiner. Characteristics of Wastewater Discharges from Coal-Fired Power Plants. In: 31st Industrial Waste Conference, Lafayette, Indiana, 1976. Purdue University, Lafayette, Indiana, 1976. p. 690.

Coltharp, W. M., N. P. Meserole, B. F. Jones, K. Schwitzgebel, R. S. Merrill, G. L. Sellman, C. M. Thompson, and D. A. Malish. Review and Assessment of the Existing Data Base Regarding Flue Gas Cleaning Wastes. Radian Corp., Austin, Texas,

Corrin, M. L. Physics of Smoke Formation. In: Proceedings of Air Quality of Urban Smoke and Forest Fires, Fort Collins, Colorado, 1973. pp. 90-100.

Coutant, R. W., J. S. McNulty, and R. D. Giammar. Determination of Trace Elements in a Combustion System. EPRI 122-1, Battelle-Columbus Laboratories, Columbus, Ohio, 1975.

Cowherd, C. Jr., et al. Hazardous Emission Characterization of Utility Boilers. Midwest Research Institute, Kansas City, Missouri, 1975.

Cox, D. B., and R. J. Ruane. Characterization of Coal Pile Drainage. EPA 600/7-77-148. Presented at EPA Second Symposium on Fugitive Emissions: Measurement and Control, Houston, Texas, May 1977.

Crockett, Alan B., and R. R. Kinnison. Mercury Distribution in Soil Around a Large Coal-Fired Power Plant. EPA-600/3-77-063, Environmental Protection Agency, Las Vegas, Nevada, 1977. 9pp.

Cross, F. L. Jr., R. J. Drago, and H. E. Francis. Metal and Particulate Emissions from Incinerators Burning Sewage Sludge and Mixed Refuse. In: Proceedings of the National Incinerator Conference, Cincinnati, Ohio, 1970. American Society of Mechanical Engineers, New York, New York, 1970. pp.62-64.

Dams, R., and C. Block. Study of Fly Ash Emission During Combustion of Coal. Environ. Sci. Technol., 10(10):1011-1017, 1976.

Dams, R., et al. Quantitative Relationships Among Trace Elements over Industrialized N. W. Indiana, Paper IAEA-SM-142a/5. In Proceeding Symposium Nuclear Technology and Environmental Pollution, Salzburg, Austria, 1970. International Atomic Energy Agency, Vienna, Austria, 1978. pp.139-157.

Davis, E. C., and W. J. Boegly, Jr. A Review of the Literature on Leachates from Coal Storage Piles. ORNL/TM-6186. Oak Ridge National Laboratory, Oak Ridge, Tennessee, 1978.

Davis, J. A., and J. O. Leckie. Effect of Adsorbed Complexing Ligands on Trace Metal Uptake by Hydrous Oxides. Environ. Sci. Technol., 12(12)1309-1315, 1978.

Davis, W. E. National Inventory of Sources and Emissions. Barium, Boron, Copper, Selenium, and Zinc 1969. Boron, Section II. APTD-1159, PB 210 677, Davis (W.E.) and Associates, Leawood, Kansas, 1972. 51pp.

Davis, W. E. National Inventory of Sources and Emissions. Barium, Boron, Copper, Selenium, and Zinc 1969. Copper, Section III. APTD-1129, PB-210 678, Davis (W.E.) and Associates, Leawood, Kansas, 1972. 74pp.

Davis, W. E. National Inventory of Sources and Emissions Barium. Boron. Copper, Selenium and Zinc 1969-Zinc Section V. PTD-1139, PB-210 680, Leawood, Kansas, 1972. 85pp.

Davis, W. E. National Inventory of Sources and Emissions. Barium, Boron, Copper, Selenium, and Zinc 1969 - Barium Section I. APTD-1140, PB210 676, Leawood, Kansas, May, 1972. 56pp.

Davis, W. E. National Inventory of Sources and Emissions: Vanadium-1968. APTD-1511, PB-221 655, Leawood, Kansas, June 1971. 62pp.

Davis, W. E. & Associates. National Inventory of Sources and Emissions: Manganese - 1968. APTD-1509. Leawood, Kansas, 1971.

Davis, W. E., and Associates. National Inventory of Sources and Emissions: Cadmium, Nickel, and Asbestos, 1968, Nickel, Section II. APTD-69, PB-192 251, Leawood, Kansas, 1970. 46pp.

Davison, R. L., D. F. S. Natusch, J. R. Wallace, and C. A. Evans, Jr. Trace Elements in Fly Ash. Dependence of Concentration on Particle Size. Environ. Sci. Technol., 8(13):1107-13, 1974.

DeAngelis, D. G., and R. B. Reznik. Source Assessment: Coal-Fired Residential Combustion Equipment Field Tests, June 1977. EPA 600/2-78-0040, Monsanto Research Corp., Dayton, Ohio, 1978.

Devitt, T. W., C. J. Sawyer, and F. D. Hall. State-of-the-Art Assessment of Air Pollution Control Technologies for Various Waste-as-Fuel Processes. In: Energy and the Environment, Proceedings of the Fifth National Conference, Cincinnati, Ohio, 1977, D. G. Nichols, et al., eds. AIChE, Dayton, Ohio, 1978. pp.167-173.

- Diehl, R. C., et al. Fate of Trace Mercury in the Combustion of Coal. PB-210 226, Bureau of Mines, Pittsburgh, Pennsylvania, 1972. 12pp.
- Dreesen, D. R., E. S. Gladnsy, J. W. Owens, B. L. Perkins, C. L. Wienke, and L. E. Wangen. Comparison of Levels of Trace Elements Extracted from Fly Ash and Levels Found in Effluent Waters from a Coal-Fired Power Plant. Environ. Sci. Technol., 11(10):1017-1019, 1977.
- Duprey, R. L. Compilation of Air Pollutant Emission Factors. AP-42, National Center Air Pollution Control, Durham, North Carolina, 1968. 67pp.
- Edginton, D. N., and J. A. Robbins. Records of Lead Deposition in Lake Michigan Sediments Since 1800. Environ. Sci. Technol., 10(3):266, 1976.
- Eimutis, E. C., and R. P. Quill. Source Assessment: Noncriteria Pollutant Emissions. MRC-DA-692, PB-270 550, Monsanto Research Corp., Dayton, Ohio, 1977. 116pp.
- Eisenbud, M., et al. Trace Metals in Urban Aerosols. American Petroleum Institute, Washington, D.C., 1975. 418pp.
- Engineering Science, Inc. Exhaust Gases from Combustion and Industrial Processes. PB 204861, Washington, D.C., 1971. 431pp.
- Ensor, D. S., T. A. Cahill, and L. E. Sparks. Elemental Analysis of Fly Ash from Combustion of a Low Sulphur Coal, pp.75-33.
- Fancher, J. R. Trace Element Emissions from the Combustion of Fossil Fuels. In: Proceedings of the Environmental Resources Conference, Cycling Contributions of Metals, 1972. National Environmental Research Center, Cincinnati, Ohio, 1973. pp.109-113.
- Feldsten, M. Combustion Emissions from Stationary Sources. In: Combustion - Generated Air Pollution Short Course, 1969. Plenum, New York, New York, 1976. pp.291-318.
- Ferguson, W. S. Appendix 5 to Complete Statement of L. M. Alexander. In: Problems of Electrical Power Production in the Southwest, Part 4, 92nd Congress (Senate), 1st Session, 1971. pp.1435-1444.
- Fisher, G. L., et al. Physical and Morphological Studies of Size-Classified Coal Flyash. Environ. Sci. Technol., 12(4):447, 1978.
- Fisher, G. L., et al. Size-Dependence of the Physical and Chemical Properties of Coal Fly Ash. Am. Chem. Soc. Div. Fuel Chem. Prepr., 22(4):149-155, 1977.

Flagan, R. C. Ash Particle Formation in Pulverized Coal Combustion. Presented at the Combustion Institute Western States Chapter Meeting, Seattle, Washington, 1977.

Fly Ash Found to be Mutagenic. Chem. Eng. News, 56(2):6-7, 1978.

Foyn, E. Problems of Fossil Fuel Combustion and Waste. Water Pollut. Control, 115(4):45-48, 1977.

French, B. R. Fly-Ash Formation in a Coal-Fired Boiler. TID-27396, New Hampshire University, Durham, North Carolina, 1976. 72pp.

Friedlander, S. K. Emission Control in an Expanding Industry: Trace Metals from Coal Combustion. PB-273 236/OST, New York University and California Institute of Technology, New York, New York and Pasadena, California, 1976. 14pp.

Fuller, W. H. Movement of Selected Metals, Asbestos, and Cyanide in Soil: Applications to Waste Disposal Problems. EPA 600/2-77-020, University of Arizona, Department of Soils, Tucson, Arizona, 1977.

Furr, A. K., T. F. Parkinson, R. A. Hinrichs, D. R. van Campen, C. A. Bache, W. H. Gutenmann, and L. E. St. John. National Survey of Elements and Radioactivity in Flyashes: Absorption of Elements by Cabbage Grown in Flyash-Soil Mixtures. Environ. Sci. Technol., 11(13):1194, 1977.

Gang, M. W., and D. Langmuir. Controls on Heavy Metals in Surface and Ground Waters Affected by Coal Mine Drainage. Clarion River-Redbank Creek Watershed, Pennsylvania. In: Papers from the 5th Symposium on Coal Mine Drainage Research, 1974. National Coal Association, Washington, D.C., 1974. pp.39-69.

Gaspar, J. R., and P. A. Dauzvarida. Assessment of Trace Element Body Burdens Due to Projected Coal Utilization in the Illinois River Basin. In: Proceedings of the 5th National Conference on Energy and the Environment, American Institute of Chemical Engineers, Cincinnati, Ohio, 1977. pp.350-354.

GCA Corp. National Emissions Inventory of Sources and Emissions of Chromium. EPA 450/3-74-012, PB 230 034. Bedford, Massachusetts, 1973.

Gladney, E. S. Trace Element Emissions of Coal-Fired Power Plants. Chalk Point Electric Generating Station. Ph.D. Thesis, University of Maryland, College Park, Maryland, 1974. 372pp.

Gladney, E. S., and J. W. Owens. Beryllium Emissions from a Coal-Fired Power Plant. Environ. Sci. Health, Environ. Sci. Eng., 11(4-5):297-312, 1976.

Gladney, E. S., J. A. Small, G. E. Gordon, and W. H. Zoller. Composition and Size Distribution of InStack Particulate Material at a Coal-Fired Power Plant. Atmos. Environ., 10(12):1071-1077, 1976.

Goldfarb, A. S., and J. W. Gentry. Particulate Size Distribution for Emissions from Oil-Fired Combustion Equipment. AIChE Symp. Ser., 70(137):327-332, 1972.

Goldgraben, G. R., K. Krickenberger, P. Clifford, N. Zimmerman, and D. Martin. Assessment of Mercury Emissions from Fossil Fueled Power Plants. EPA 600/7-78-146, PB-285 227, Mitre Corp., McLean, Virginia, Washington, D.C., 1978. 106pp.

Goldstein, H. L., and C. W. Siegmund. Influence of Heavy Fuel Oil Composition and Boiler Combustion Conditions on Particulate Emissions. Environ. Sci. Technol., 10(12):1109-1114, 1976.

Gordon, G. E., W. H. Zoller, E. S. Gladney, and R. R. Greenberg. The Use of Instrumental Nuclear Activation Methods in the Study of Particles from Major Air Pollution Sources. CONF-740701. In: Proceedings of Nuclear Methods in Environmental Research, International Symposium, 1974. IAEA, Vienna, Washington, 1974. pp.344-355.

Gowman, L. P. Chemical Stability of Metal Silicates vs. Metal Hydroxides in Ground Water Conditions. Chemfix, Pittsburgh, Pennsylvania.

Greenberg, R. R., G. E. Gordon, W. H. Zoller, R. B. Jacko, D. W. Neuendorf, and K. J. Yost. Composition of Particles Emitted from the Nicosia Municipal Incinerator. Environ. Sci. Technol. 12(12):1329-1332, 1978.

Greenberg, R. R., W. H. Zoller, and G. E. Gordon. Composition and Size Distributions of Particles Released in Refuse Incineration. Environ. Sci. Technol., 12(5):566-573, 1978.

Gruhl, J. Quantification of Aquatic Environmental Impact of Electric Power Generation. MIT-EL 78-004, PB 224 64, MIT, Energy Laboratory, Cambridge, Massachusetts, 1973.

Gutenmann, W. H., and C. A. Bache. Selenium in Fly Ash. Science, 191:966-967, 1975.

Guthrie, R. K., and D. S. Cherry. Pollutant Removal from Coal-Ash Basin Effluent. Water Resources Bull., 12(5):889-902, 1976.

Hall, E. H., C. M. Allen, D. A. Ball, J. E. Burch, H. N. Conkle, W. T. Lawhon, T. J. Thomas, and G. R. Smithson, Jr. Comparison of Fossil and Wood Fuels, Final Report. EPA 600/2-76-056, PB 251 622, Battelle-Columbus Laboratory, Columbus, Ohio, 1976.

Hall, S. K. Pollution and Poisoning. Environ. Sci. Technol., 6(1):31-35, 1972.

Harris, F., A. Andren, and G. Henderson. Trace Elements from Coal-Plants. ORNL Rev., 8(2):20, 1975.

Hart, F. C., and B. T. DeLaney. The Impact of RCRA (PL 94-580) on Utility Solid Wastes. EPRI FP-878, EPRI TPS 78-779, Fred C. Hart Associates, Inc., New York, 1978.

Haynes, B. W., S. L. Law, and W. J. Campbell. Metals in the Combustible Fraction of Municipal Solid Waste. (3)RI-8244, PB272946, Bureau of Mines, College Park, Maryland, 1977. 21pp.

Heit, M. Review of Current Information on Some Ecological and Health Related Aspects of the Release of Trace Metals into the Environment Associated with the Combustion of Coal. HASL-320, U.S. Energy Research and Development Administration, New York, 1977. 53pp.

Holland, W. F., and B. F. Jones. Potential for Ground Water Contamination by Trace Elements in Pondered Ash and Scrubber Sludge. Preprint 3289. Presented at the ASCE Spring Convention and Exhibit, Pittsburgh, Pennsylvania, 1978.

Holland, W. F., K. A. Wilde, J. L. Parr, P. S. Lowell, and R. F. Pohler. Environmental Effects of Trace Elements from Pondered Ash and Scrubber Sludge. PB-252 090, Radian Corp., Austin, Texas, 1975. 403pp.

Horton, J. H., R. S. Dorsett, and R. E. Cooper. Trace Elements in the Terrestrial Environment of a Coal-Fired Powerhouse. DP-1475, Du Pont de Nemours (E.I.) and Co., Aiken, South Carolina, 1976. 53pp.

Howard, F. S. Statement: Hazardous Waste Management. Presented at the EPA Hazardous Waste Management Meeting, 1975. 24pp.

Hulett, L. D., J. A. Carter, K. D. Cook, J. F. Emery, D. H. Klein, W. S. Lyon, G. A. Nyssen, W. Fulkerson, and N. E. Bolton. Trace Element Measurements at the Coal-Fired Allen Steam Plant--Particle Characterization. In: Coal Utilization Symposium Focus on SO₂ Emission Control, Louisville, Kentucky, 1974. National Coal Association, Washington, D.C., 1974. pp.207-213.

Jackson, J. W. A Bioenvironmental Study of Emissions from Refuse Derived Fuel. AD/A-024661, Environmental Health Lab., McClellan Air Force Base, California, 1976. 113pp.

Jones, B. F. III, K. Schwitzgebel, and C. M. Thompson. Evaluation of the Physical Stability and Leachability of Flue Gas Cleaning Wastes. EPRI Research Project 782-6, Draft Report. Radian Corp., Austin, Texas, 1977.

Jones, B. F., L. J. Holcombe, and K. R. Williams. A Study of Fly Ash, Bottom Ash and Scrubber Sludge Disposal at Pacific Gas and Electric's Proposed Fossil 1 and 2, Phase I. DCN 78-200-278-07, Radian Corp., Austin, Texas, 1978.

Jordan, A. R., M. Willrich, J. J. Schanz, R. L. Lowrie, and J. D. Haun. Public Policy Toward Environment 1973: A Review and Appraisal of Fossil Energy. Ann. N.Y. Acad. Sci., 216:63-78, 1973.

Jurinak, J. J., et al. A Model of Environmental Transport of Heavy Metals Originating from Stack Derived Particulate Emission in Semi-Arid Regions. Utah State University, Logan, Utah, 1977.

Kaakinen, J. W. Trace Element Study in a Pulverized Coal Fired Power Plant. Ph.D., University of Colorado, Boulder, Colorado, 1974. 200pp.

Kaakinen, J. W., and R. M. Jorden. Determination of a Trace Element Mass Balance for a Coal-Fired Power Plant. CONF 730802. In: Proceedings of the 1st Annual NSF Trace Contaminants Conference, 1974. pp.165-184.

Kaakinen, J. W., R. M. Jorden, M. H. Lawasani, and R. E. West. Trace Element Behavior in Coal Fired Power Plant. Environ. Sci. Technol., 9(9):862-869, 1975.

Kaakinen, J. W., R. M. Jorden, M. H. Lawasani, and R. E. West. Trace Element Behavior in a Coal-Fired Power Plant. Am. Chem. Soc. Div. Environ. Chem. Prepr., 15(1):136-138, 1975.

Kalb, G. W. Total Mercury Mass Balance at a Coal-Fired Power Plant. Adv. Chem. Ser., 141:154-174, 1975.

Karacki, S. S., and F. L. Corcoran, Jr. Coal Ash Analysis with an Argon Plasma Emission Excitation Source. Appl. Spectro., 27(1):41-42, 1973.

Klein, D. H., A. W. Andren, and N. E. Bolton. Trace Element Discharges from Coal Combustion for Power Production. Water, Air, Soil Pollut., 5(1):71-77, 1975.

Klein, D. H., A. W. Andren, J. A. Carter, et al. Pathways of Thirty-Seven Trace Elements through Coal Fired Power Plant. Environ. Sci. Technol., 9(10):973-979, 1975.

Klein, D. H., and P. Russell. Heavy Metals: Fallout Around a Power Plant. Environ. Sci. Technol., 7(4):357-358, 1973.

Kuhn, J. K., and J. F. Shimp. Determination and Mobility of Organically Associated Trace and Minor Elements in Coal. In: Abstracts of the Federation of Analytical Chemistry and Spectroscopy Societies Fifth Annual Meeting, Boston, 1978.

Kukin, I. Additives Can Clean Up Oil-Fired Furnaces. Environ. Sci. Technol., 7(7):606-610, 1973.

Law, S. L. Dissolved Metals in Aqueous Effluents from Municipal Incinerators. J Water Pollut. Control Fed., 49(12):2453-2466, 1977.

Law, S. L. Metals in Ash Materials Filtered from Municipal Incinerator Effluents. Resource Recovery Conserv., 3(1):19-40, 1978.

Law, S. L., B. W. Haynes, and W. J. Campbell. Metals in the Combustible Fraction of Municipal Solid Waste. Presented at the American Chemical Society 11th Middle Atlantic Regional Meeting, Washington, D.C., 1977.

Law, S. L., H. E. Marr III, and W. J. Campbell. Concentration and Source of Trace Elements in the Combustible Fraction of Urban Refuse. In: Proceedings of the Fifth Mineral Waste Utilization Symposium, E. Aleshin, ed., 1976. pp.251-252.

Leavitt, C., et al. Environmental Assessment of Coal- and Oil-Firing in a Controlled Industrial Boiler; Volume 3. EPA-600/7-78-164c. TRW, Inc., Redondo Beach, California, 1978.

Lee, R. E. Jr. Concentration and Size of Trace Metal Emissions From a Power Plant, a Steel Plant, and a Cotton Gin. Environ. Sci. Technol. 9(7):643-647., 1975.

Lee, S. H. D., I. Johnson, and J. Fischer. Study of the Volatility of Minor and Trace Elements in Illinois Coal. ANL. CEN/FE-77-4, Argonne National Lab., Argonne, Illinois, 1977. 27pp.

Lewis, C. Water Pollution Problems Associated with Control of Stack Gas Emission. Ind. Wastes, 19(1):19-21, 1973.

Lewis, R. A., A. S. Lefohn, and N. R. Glass. The Ecological Effects of Energy Conversion Activities on the Terrestrial Environment: The Environmental Protection Agency's Program. Presented at the EPA National Conference on Health, Environmental Effects, and Control Technology of Energy Use, Washington, D.C., February 1976.

Lewis, R. A., N. R. Glass, and A. L. Lefohn. The Bioenvironmental Impact of a Coal-Fired Power Plant, Colstrip, Montana: June 1975. EPA 600/3-76-013, PB-252 177, Environmental Protection Agency, Corvallis, Oregon, 1976. 333pp.

Lindberg, S. E., A. W. Andren, R. J. Raridon, and W. Fulkerson. Mass Balance of Trace Elements in Walker Branch Watershed: Relation to Coal-Fired Steam Plants. Environ. Hlth. Persp., 12:9-18, 1975.

Linton, R. W., A. Loh, D. F. S. Natusch, C. A. Evans, Jr., and P. Williams. Surface Predominance of Trace Elements in Airborne Particles. *Science*, 191(4229):852-854, 1976.

Linton, R. W., P. Williams, C. A. Evans, and D. F. S. Natusch. Determination of the Surface Predominance of Toxic Elements in Airborne Particles by Ion Microprobe Mass Spectrometry and Auger Electron Spectrometry. *Anal. Chem.*, 49(11):1514-1520, 1977.

Lyon, W. S. Atmospheric Modeling and Discharge. In: Trace Element Measurements at the Coal-Fired Steam Plant, W. S. Lyon, Jr., CRC Press, Cleveland, Ohio, 1975. pp.107-117.

Lyon, W. S. Trace Element Measurements at a Coal-Fired Steam Plant. CRC Press, Cleveland, Ohio, 1977.

Lyon, W. S., and J. F. Emery. Neutron Activation Analysis Applied to the Study of Elements Entering and Leaving a Coal-Fired Steam Plant. *Int. J. Environ. Anal. Chem.*, 4(2):125-133, 1975.

Lyon, W. S., et al. Instrumental Neutron Activation Analysis of Effluents from Coal Fired Power Plants. CONF-740701. In: Proceedings of the 2nd International Conference on Nuclear Methods in Environmental Research. pp.376-384.

Lyon, W. S., L. C. Bate, and J. F. Emery. Environmental Pollution Use of Neutron Activation Analysis to Determine the Fate of Trace Elements from Fossil Fuel Combustion in the Ecological Cycle. In: Nuclear Activation Techniques in the Life Sciences, M. Krippner, ed. International Atomic Energy Agency, Vienna, Austria, 1972. pp.253-262.

Lyon, W. S., L. C. Bate, F. F. Dyer, J. S. Eldridge, J. F. Emery, S. A. Reynolds, E. Ricci, J. E. Strain, H. E. Zittel, C. Feldman, and K. J. Northcutt. Trace Element Profiles through a Coal-Fired Steam Plant. In: Analytical Chemistry Division Annual Progress Report, September 1972. Oak Ridge National Lab., Oak Ridge, Tennessee, 1973. pp.30-31.

Mace, G. R. Treatment of Liquid Wastes in the Power Industry, Paper 7. In: Proceedings of the 8th Annual Front of Power Technology Conference, Stillwater, Oklahoma, 1975. Oklahoma State University, Engineering Extension, Stillwater, Oklahoma, 1975. 13pp.

Magee, E. M., H. J. Hall, and G. M. Varga, Jr. Potential Pollutants in Fossil Fuels. EPA-R2-73-249, PB-225 039, ESSO Research and Engineering Co., Linden, New Jersey, 1973. 292pp.

Magee, R. A., F. B. Meserole, and R. G. Oldham. Coal-Fired Power Plants Trace Element Study, Volume I: A Three-Station Comparison. Radian Corporation, Austin, Texas, 1975.

- Mann, R. M., R. A. Magee, R. V. Collins, M. P. Fuchs, and F. G. Mesich. Trace Element Study of Fly Ash: Emissions from Coal-Fired Steam Plants Equipped with Hot-Side and Cold-Side Electrostatic Precipitation for Particulate Removal. EPA 908/4-78-008. Radian Corp., Austin, Texas, 1978.
- Marr, H. E., S. L. Law, and D. L. Neylan. Trace Elements in the Combustible Fraction of Urban Refuse, Paper 4-3. In: 3rd International Conference on Environmental Sensing and Assessment, Las Vegas, Nevada, 1975. IEEE, New York, New York, 1976. 6pp.
- Martin, J. J. Quality of Effluents from Coal Refuse Piles. Presented at the 1st Symposium on Mine Preparation Plant Refuse Disposal, 1974.
- Martin, L. F. Industrial Water Purification Pollution Technology Review. Noyes Data Corp., Park Ridge, New Jersey, 1974. 299pp.
- Mason, B. Principles of Geochemistry. John Wiley and Sons, Inc., New York, 3rd Edition, 1976. pp.45-46.
- Massey, H. F., and R. I. Barnhisel. Copper, Nickel, and Zinc Released from Acid Coal Mine Spoil Materials of Eastern Kentucky. Soil Sci., 113(3):207-212, 1972.
- Matle, P. C. Organic Pollutants from Pulverized Coal Combustion (A Review). WSS/CI-77-48. Presented at the Combustion Institute Western States Chapter Meeting, Palo Alto, California, 1977. 26pp.
- Metals Focus Shifts to Cadmium. Environ. Sci. Technol., 5(9):754-755, 1971.
- Micheletti, W. C. Field Testing and Lab Studies for Toxic Utility Effluents. Radian Corp., Austin, Texas, 1977.
- Montague, P. Statement of Peter Montague, Southwest Research and Information Center, Albuquerque, New Mexico. In: Problems of Electrical Power Production in the Southwest. Part I. 92nd Congress (Senate), 1st Session, 1971. pp.156-166.
- Moyer, T. J. Controlling Particulate Emissions from Spreader Stoker-Fired Boilers. Plant Eng., 30(26):60, 1976.
- Muter, R. B., and L. L. Nice. Trace Elements in Fuel. Adv. Chem. Ser., (141):57-65, 1975.
- Natusch, D. F. S., C. F. Bauer, H. Matusiewicz, C. A. Evans, J. Baker, A. Loh, R. W. Linton, and P. K. Hopke. Characterization of Trace Elements in Fly Ash. In: International Conference Proceedings on Heavy Metals in the Environment, Volume 2, Part 2, Toronto, Canada, 1975. pp.553-575.

Natusch, D. F. S., J. R. Wallace, and C. A. Evans, Jr. Toxic Trace Elements: Preferential Concentration in Respirable Particules. Science, 183:202, 1974.

Natusch, D. F., et al. Trace Metals in Airborne Particles. In: Proceedings of the 3rd International Clean Air Congress, Dusseldorf, West Germany, 1973. pp.C12-C14.

Nelson, K. W. Industrial Contributions of Arsenic to the Environment. Environ. Hlth. Persp., 19:31-34, 1977.

Niessen, W. R., and A. F. Sarofim. Incinerator Air Pollution: Facts and Speculation. In: Proceedings of the National Incinerator Conference, Cincinnati, Ohio, 1970. American Society of Mechanical Engineers, New York, New York, 1970, pp.167-181.

Oak Ridge National Laboratories. Trace Element Measurements at the Coal Fired Allen Steam Plant. Progress Report, February 1973 - July 1973. Oak Ridge, Tennessee, 1974.

Ondov, J. M., et al. Interlaboratory Comparison of Neutron Activation and Atomic Absorption Analyses of Size-Classified Stack Fly Ash. CONF-760985-2, UCRL-78194, University of California, Livermore, California, 1977. 14pp.

Ondov, J. M., R. C. Ragaini, A. H. Biermann, C. E. Choquette, G. E. Gordon, and W. H. Zoller. Elemental Emissions from a Western Coal-Fired Power Plant: Preliminary Report on Concurrent Plume and In-Stack Sampling. UCRL-78825, Presented at the American Chemical Society, Div. of Environmental Chemistry Meeting, New Orleans, Louisiana, 1977.

Ondov, J. M., R. C. Ragaini, and A. H. Biermann. Comparisons of Particulate Emissions from a Wet Scrubber and Electrostatic Precipitator at a Coal-Fired Power Plant. Am. Chem. Soc. Div. Environ. Chem. Prepr., 16(2):200-203, 1976.

Ondov, J. M., R. C. Ragaini, and A. H. Biermann. Characterization of Trace Element Emissions from Coal-Fired Power Plants. Rept. No: CIBF-661962-6, UCRL-80412. In: International Conference on Nuclear Methods in Environmental and Energy Research. Columbia, Missouri, 1977. 21pp.

Ondov, J. M., R. C. Ragaini, and A. H. Biermann. Characterization of Trace Element Emissions from Coal-Fired Power Plants. CONF-771072-6, UCRL-80412, University of California, Livermore, California, 1978. 21pp.

Papungo, F., et al. Nucleation Properties of Fly Ash in a Coal-Fired Power-Plant Plume. Atmos. Environ., 12(4):929-935, 1978.

Pechan, E. H. 1985 Air Pollution Emissions. DOE/PE--0001. Department of Energy, Washington, D.C., 1977.

Peterson, C. M., B. F. McLouth, and A. J. Roberts. Recovery of Precious Metals by Incineration of Epoxy Glass Laminates, Paper 68-185. Presented at the 61st Annual Air Pollution Control Association Meeting, St. Paul, Minnesota, 1968.

Pezzetta, J. M., and I. K. Iskandar. Sediment Characteristics in the Vicinity of the Pulliam Power Plant, Green Bay, Wisconsin. Env. Geology, 1(3):155, 1975-1976.

Phillips, M. A. Investigations into Levels of Both Airborne Beryllium and Beryllium in Coal at the Hayden Power Plant near Hayden, Colorado. Environ. Lett., 5(3):183-188, 1973.

Piperno, E. Trace Element Emissions. Aspects of Environmental Toxicology. Adv. Chem. Ser., (141):192-209, 1975.

Plumley, A. L. Fossil Fuel and the Environment. Present Systems and Their Emissions. Combustion, 43(4):36-43, 1971.

Pollock, E. N. Trace Impurities in Coal. Am. Chem. Soc. Div. Fuel Chem. Prepr., 18(4):92-105, 1973.

Radian Corp., Austin, Texas. Coal Fired Power Plant Trace Element Study. 4 Volumes. A Three Station Comparison. PB-257 293, Austin, Texas, 1975. 87pp.

Radian Corporation. Air Quality Impact of Unit 3 of the Big Brown Steam Electric Station. DCN 77-100-208-03, Austin, Texas, 1977.

Radian Corporation. Analysis of Refinery Wastewaters for the EPA Priority Pollutants. DCN 78-200-192-01, Austin, Texas, 1978.

Radian Corporation. Study of Non-Hazardous Wastes from Coal-Fired Utilities. DCN 200-187-41-07, Austin, Texas, 1978.

Ragaini, R. C., and J. M. Ondov. Trace Contaminants from Coal-Fired Power Plants. CONF-750963-2, UCRL-76794, University of California, Livermore, California, 1975. 18pp.

Ragaini, R. C., and J. M. Ondov. Trace-Element Emissions from Western U.S. Coal-Fired Power Plants. CONF-760915-4, UCRL-77669 (Rev. 1). Presented at the Modern Trend in Activation Analysis Meeting, Munich, Germany, 1976. 11pp.

Ragaini, R. C., and J. M. Ondov. Trace-Element Emissions from Western U.S. Coal-Fired Power Plants. CONF-760915-4, UCRL-77669 (Rev. 1). Presented at the Modern Trend in Activation Analysis Meeting, Munich, Germany, 1976. 11pp.

Rancitelli, L. A. Inorganic Emissions from the Hanford Steam Plant. BNWL-1551, Part 2. In: Pacific Northwest Lab. Annual Report for 1970 to the USAEC Division of Biology and Medicine, Volume 2. Battelle Memorial Institute, Richland, Washington, 1971. pp.37-38.

Raridon, R. J., and A. W. Andren. Computer Simulation of Trace Metal Transport. In: International Conference Proceedings on Heavy Metals in the Environment, Volume 2, Part I, Toronto, Canada, 1975. pp.321-330.

Ray, S. S., and F. G. Parker. Characterization of Ash from Coal-Fired Power Plants. PB-265 374, EPA 600/7-77-010, Tennessee Valley Authority, Chattanooga, Tennessee, 1977. 142pp.

Recharo, P. A. Hydrological Impacts Associated with Coal Mining, Mining Congr. J., 61(8):70-75, 1975.

Rice, J. K., and S. D. Strauss. Water Pollution Control in Steam Plants. Power, 21(4), 1977.

Rigo, H. G., S. A. Hathaway, and F. C. Hildebrand. Preparation and Use of Refuse Derived Fuels in Industrial Scale Applications. In: 1st International Conversion Refuse Energy Conference, Montreaux, Switzerland, 1975. Systems Technology Corp., Dayton, Ohio, 1975. pp.22-27.

Rochester University. Report of the Health Effects Committee ERDA Workshop on the Health Effects of Trace Contaminants from Coal Combustion. CONF-7609130-1, UR-2490-1106, New York, New York, 1976. 31pp.

Roffman, H. K., R. E. Kary, and T. Hudgins. Ecological Distribution of Trace Elements Emitted by Coal-Burning Power Generating Units Employing Scrubbers and Electrostatic Precipitators. In: Papers from the Symposium on Coal Mine Drainage Research, 1977. National Coal Association, Washington, D.C., 1977. pp.192-215.

Rolan, R. G. Design and Implementation of an Environmental Monitoring Program for ERDA Fossil Fuel Facilities. FE--2495-6., Dalton, Dalton, Littleand Newport, Cleveland, Ohio. 1977.

Ross, W. D., J. L. Pyle, and R. E. Sievers. Analysis for Beryllium in Ambient Air Particulates by Gas Chromatography. Environ. Sci. Technol., 11(5):467, 1977.

Rossoff, J., and R. C. Rossi. Disposal of By-Products from Non-Regenerable Flue Gas Desulfurization Systems: Initial Report. EPA/650/2-74-037a, PB-237 114, Aerospace Corp., El Segundo, California, 1974. 318pp.

Rubin, E. S. A Systematic Approach to Characterizing Energy-Environment Tradeoffs for Coal Utilization Technologies. In: Energy and the Environment, Proceedings of the Fifth National Conference, Cincinnati, Ohio, 1977, D. G. Nichols, et al., eds. AIChE, Dayton, Ohio, 1978. pp.124-131.

Ruch, R. R., H. J. Gluskoter, and N. F. Shimp. Occurrence and Distribution of Potentially Volatile Trace Elements in Coal. NTIS Report, PB-238 091, 1974.

Ruch, R. R., H. J. Gluskoter, and N. F. Shimp. Occurrence and Distribution of Potentially Volatile Trace Elements in Coal. EPA/650/2-74-054, PB-238 091, Illinois State Geological Survey, Urbana, Illinois, 1974. 94pp.

Schultz, H., E. A. Hattman, and W. B. Booher. Fate of Some Trace Elements During Coal Pretreatment and Combustion. Am. Chem. Soc. Div. Fuel Chem. Prepr., 18(4):108-113, 1973.

Schultz, H., E. A. Hattman, and W. B. Booher. Fate of Some Trace Elements During Coal Pretreatment and Combustion. Adv. Chem. Ser., 141:139-153, 1975.

Schwitzgebel, K., et al. Comparative Study of Trace Element Emissions in Three Coal-Fired Power Stations, 4 Volumes. Radian Corp., Austin, Texas, 1975.

Schwitzgebel, K., et al. Trace Element Balance at SCE's Horizontal Wet Scrubber Operated at the Mohave Steam Plant. Radian Corp., Austin, Texas, 1975.

Schwitzgebel, K., R. A. Magee, and F. B. Meserole. The Removal of trace elements through the use of the 170 MW Horizontal Scrubber, 3 Volumes. Radian Corp., Austin, Texas, 1975.

Shannon, L. J., and M. P. Schrag. Environmental Impact of Waste-to-Energy Systems. In: Energy and the Environment, Proceedings of the Fourth National Conference, Cincinnati, Ohio, 1976. AIChE, Dayton and Ohio Valley Section, APCA, Pittsburgh, Pennsylvania, 1976. pp.187-193.

Sheibley, D. W. Trace Element Analysis of Coal By Neutron Activation. Am. Chem. Soc. Div. Fuel Chem. Prepr., 18(4):59-71, 1973.

Shendrikar, A. D., and P. W. West. Determination of Selenium in the Smoke from Trash Burning. Environ. Lett., 5(1):39-35, 1973.

Shubert, R. H. Treatment of Coal Washery Waters. U.S. Patent 3,856,668, 1973.

Simpson, C. L., et al. Pacific Northwest Laboratory Annual Report for 1975 to the U.S. ERDA Division of Biomedical and Environmental Research, Part 3, Atmospheric Sciences. BNWL-2000PT3, Battelle Pacific Northwest Laboratories, Richland, Washington, 1976.

Singh, J. J. Trace Elemental Characteristics of Aerosols Emitted from Municipal Incinerators. NASA-TM-78630, N78-18572, NASA, Langley Research Center, Langley Station, Virginia, 1978. 31pp.

Singh, J. J., R. J. Sentell, and G. S. Khandelwal. An Investigation of Size-Dependent Concentration of Trace Elements in Aerosols Emitted from the Oil-Fired Heating Plants. NASA-TM-X-3401, NASA, Langley Station, Virginia, 1976. 29pp.

Smith, M. F. Fly Ash. National Technical Information Service, Springfield, Virginia, 1975.

Smith, M. F. Fly Ash. Volume 3. November, 1977-September, 1978 (Citations from the Engineering Index Data Base). NTIS/PS-78/1072, NTIS, Springfield, Virginia, 1978. 139pp.

Smith, R. D., J. A. Campbell, and K. K. Nielson. Mechanisms for Trace Element Enrichment in Fly Ash During Coal Combustion. Am. Chem. Soc. Div. Fuel Chem. Prepr., 23(1):196-205, 1978.

Sondreal, E. A., W. R. Kube, and J. L. Elder. Characteristics and Variability of Lignite Ash from the Northern Great Plains Province. CDNF-650463. Technology and use of Lignite Proceedings, Bismark, North Dakota, April 1965, J. L. Elder and W. R. Kube, Comp., Bureau of Mines, Grand Forks, North Dakota, 1966.

Southern California Edison Co. Safe Disposal of Toxic Elements in Coal Ash and Scrubber Sludge. EPRI-RP22, Palo Alto, California, 1974.

Spangler, C. V. National Inventory of Sources and Emissions: Manganese - 1968. APTD-1509, PB 220 620, Davis (W.E.) and Associates, Leawood, Kansas, 1971. 70pp.

Statnick, R., R. Grote, and R. Steiber. Evaluation of Continuous Mercury Monitor on Combustion Sources. Environ. Sci. Technol., 10(6):595, 1976.

Steiner, W. E., and G. W. Reynolds. Trace Element Study for Four Corners Power Generating Plant and Navajo Mine. Woodward-Envicon, Scottsdale, Arizona, 1974. pp.1-59.

Stephens, N. T., A. K. Furr, C. R. Thompson, and R. L. Carter. Trace Metals in Effluents from Coal-Fired Furnaces. In: Proceedings of the 4th Annual Environmental Engineering and Science Conference, Louisville, Kentucky, 1974. pp.701, 703-717.

Stephens, R. H., C. Braxton, and M. M. Stephens. Atmospheric Emissions from Offshore Oil and Gas Development and Production. EPA 450/3-77-026, Energy Resources Co., Cambridge, Massachusetts, 1977.

Strojan, C. L., and F. B. Turner. Trace Elements and Sulfur in Soils and Plants Near the Mohave Generating Station in Southern Nevada. Presented at the 4th Joint Conference on Sensing of Environmental Pollution, New Orleans, Louisiana, 1977.

Struemppler, A. W. Trace Metals in Rain and Snow During 1973 at Chardron, Nebraska. Atmos. Environ., 10(1):33-37, 1976.

Suhr, N. H., and H. Gong. Comparison of Atomic Absorption and D. C. Plasma-Arc Spectrometry in Multi-Element Analysis of Coal. Am. Chem. Soc. Div. Fuel Chem. Prepr., 22(5):56-59, 1977.

Surprenant, N., R. Hall, and L. M. Seale. Preliminary Emissions Assessment of Conventional Stationary Combustion Systems. Volume I. Executive Summary. (3)EPA/600/2-76/046a, PB-251612, GCA Corp., Bedford, Massachusetts, 1976. 86pp.

Surprenant, N., R. Hall, and L. M. Seale. Preliminary Emissions Assessment of Conventional Stationary Combustion Systems. Volume II. EPA 600-2-76-046b, PB-251 612, GCA Corp., Bedford, Massachusetts, 1976. 86pp.

Swanson, V. E. Composition and Trace-Element Content of Coal and Power Plant Ash. In: Southwest Energy Study, Appendix J, Coal Resources, Part II. Southwest Energy Federal Task Force, 1972. pp.1-61.

Talbot, R. W., M. A. Anderson, and A. W. Andren. Qualitative Model of Heterogeneous Equilibria in a Fly Ash Pond. Environ. Sci. Technol., 12(9):1056-1062, 1978.

Taylor, H. E., and R. Brown. Analysis of Trace Elements in Environmental Materials and Wastes by Spark Source Mass Spectroscopy. Instrum. Min. Metall. Ind., (2):21-25, 1974.

Theis, T. L. Potential Trace Metal Contamination of water resources through the Disposal of Fly Ash. CONF-750530-3, University of Notre Dame, Notre Dame, Indiana, 1976. 21pp.

Theis, T. L., and J. L. Wirth. Sorptive Behavior of Trace Metals on Fly Ash in Aqueous Systems. Environ. Sci. Technol., 11(12):1096-1100, 1977.

Theis, T. L., and R. O. Richter. Chemical Speciation of Heavy Metals in Power Plant Ash Pond Leachate. Environ. Sci. Technol., 13(2):219-224, 1979.

Thompson, W. E., and J. W. Harrison. Survey of Projects Concerning Conventional Combustion Environmental Assessments. EPA 600/7-78-139, Research Triangle Institute, Research Triangle Park, North Carolina, 1978.

Toca, F. M., C. M. Cheever, and C. L. Berry. Lead and Cadmium Distribution in the Particulate Effluent from a Coal-Fired Boiler. Amer. Ind. Hyg. Assoc. J., 34(9):396-403, 1973.

Torrey, S., ed. Trace Contaminants from Coal. Noyes Data Corp., Park Ridge, New Jersey, 1978.

Tullar, I. V., and I. H. Suffet. The Fate of Vanadium in an Urban Air Shed: The Lower Delaware River Valley. APCA J, 25(3):282-286, 1975.

U.S. Energy Research and Development Administration, Division of Biomedical and Environmental Research. Project Abstracts for the Federal Inventory of Energy-Related Biomedical and Environmental Research for FY 1974 and FY 1975, Volumes 2-5. ERDA 110, G.P.O., Washington, D.C., 1975.

U.S. Senate Committee on Public Works. A Legislative History of the Energy Supply and Environmental Coordination Act of 1974, Volume 1. Report 94-7, Washington, D.C., 1976.

U.S. Environmental Protection Agency, Office of Water Program Operations. Municipal Sludge Management: Environmental Factors. EPA 430/9-77-004, Washington, D.C., 1977.

Ulrich, G. D. An Investigation of the Mechanism of Fly-Ash Formation in Coal-Fired Utility Boilers. In: Fossil Energy. Dept. of Energy, Washington, D.C., 1977. 16pp.

Ulrich, G. D. Investigation of the Mechanism of Fly-Ash Formation in Coal-Fired Utility Boilers. Interim Report. February--March 1976. FE-2205-1, New Hampshire University, Durham, New Hampshire, 1976. 11pp.

Ulrich, G. D. Investigation of the Mechanism of Fly-Ash Formation in Coal-Fired Utility Boilers. Interim Report. August 1--October 31, 1976. 18(3)FE-22053, New Hampshire University, Durham, New Hampshire, 1976. 9pp.

Ulrich, G. D. Investigation of the Mechanism of Fly-Ash Formation in Coal Fired Utility Boilers. Quarterly Report. February 1--April 30, 1977. 18(3)FE-2205-6, New Hampshire University, Durham, New Hampshire, 1977. 11pp.

Unfinished Tasks and Recommendations for Future Work. Trace Element Measurement in a Coal-Fired Steam Plant, W. S. Lyon. CRC Press, Cleveland, Ohio, 1977. pp.119-127.

Van Hook, R. I. Potential Health and Environmental Effects of Trace Elements and Radionuclides From Increased Coal Utilization. ORNL--5367, Oak Ridge, National Lab., Oak Ridge, Tennessee, 1978.

Van Hook, R. I., and W. D. Shults. Effects of Trace Contaminants from Coal Combustion. Proceedings of a Workshop, Knoxville, Tennessee. August 2--6, 1976. ERDA-77-64, Energy Research and Development Administration, Washington, D.C., 1977. 83pp.

Vaughan, B. E., et al. Review of Potential Impact on Health and Environmental Quality from Metals Entering the Environment as a Result of Coal Utilization. Battelle Memorial Institute Pacific Northwest Laboratories, Richland, Washington, 1975.

Vitez, B. Trace Elements in Flue Gases and Air Quality Criteria. Power Eng., 80(1):56-60, 1976.

von Lehmden, D. J., R. H. Jungers, and R. E. Lee, Jr. Determination of Trace Elements in Coal, Fly Ash, Fuel Oil, and Gasoline-A Preliminary Comparison of Selected Analytical Techniques. Ana. Chem., 46(2):239-245, 1974.

Wagenet, R. J., W. J. Grenney, and J. J. Jurinak. Environmental Transport Model of Heavy Metals. ASCE J. Environ. Eng. Div., 104(1):61-76, 1978.

Wangen, L. E., and C. L. Wienke. Review of Trace Element Studies Related to Coal Composition in the Four Corners Area of New Mexico. LA-6401-MS, Los Alamos Scientific Laboratory, Los Alamos, New Mexico, 1976. 56pp.

Wewerka, E. M., et al. Trace Element Characterization and Removal/Recovery from Coal and Coal Wastes. Progress Report, October 1--December 31, 1976. Energy Research and Development Administration. Los Alamos Scientific Lab., Los Alamos, New Mexico, 1977. 62pp.

Wewerka, E. M., J. M. Williams, and N. E. Vanderbough. Trace Element Characterization and Removal/Recovery from Coal and Coal Wastes. Work Plan, October 1, 1976--September 30, 1977. Energy Research and Development Administration. Los Alamos Scientific Lab., New Mexico, 1977. 14pp.

Wewerka, E. M., J. M. Williams, and P. L. Wanek. Assessment and Control of Environmental Contamination from Trace Elements in Coal Processing Wastes. CONF-760208-1, LA04-76-86, Los Alamos Scientific Lab., New Mexico, 1976. 7pp.

Wewerka, E. M., J. M. Williams, N. E. Vanderbough, A. W. Harmon, and P. Wagner. Trace Element Characterization of Coal Wastes. EPA 600/7-78-028a, University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico, 1978.

Wewerka, E. M., J. M. Williams, P. O. Wanek, and J. D. Olsen. Environmental Contamination from Trace Elements in Coal Preparation Wastes. A Literature Review and Assessment. EPA-600/7-76-007, PB-267 339, Los Alamos Scientific Lab., New Mexico, 1976. 69pp.

White, J. C., et al. Analytical Techniques for Determining Levels and Fates of Trace Elements in a Fossil-Fueled Steam Plant. In: Proceedings on Comparative Studies of Food and Environmental Contaminants, 1973. IAEA, Vienna, Austria, 1974. pp.455-470.

Whittemore, D. O., and J. Switek. Geochemical Controls on Trace Element Concentrations in Natural Water of a Proposed Coal Ash Landfill Site. PB-270 429, Kansas Water Resources Research Inst., Manhattan, Kansas, 1977. 86pp.

Wiersma, J. H., et al. Effect of a Fossil Fuel Power Plant's Cooling Water System on the Water Quality of Green Bay, Wisconsin. In: Proceedings of the 17th Conference on Great Lakes Research, Hamilton, Ontario, 1974, Part I. International Association for Great Lakes Research, 1974. pp.535-543.

Williams, J. J., E. M. Wewerka, and N. E. Vanderborgh. Environmental Pollution by Trace Elements in Coal Preparation Wastes. In: Papers from the Symposium on Coal Mine Drainage Research, 1977. National Coal Association, Washington, D.C., 1977. pp.51-60.

Williams, J. M., E. M. Wewerka, N. E. Vanderborgh, P. Wagner, P. L. Wanek, and J. D. Olsen. Environmental Pollution by Trace Elements in Coal Preparation Wastes. LA-UR-77-1850, Los Alamos Laboratories, Los Alamos, New Mexico, 1977. 11pp.

Wood Waste Combustion in Boilers. In: Compilation of Air Pollution Emission Factors, 2nd Ed. U.S. EPA, Research Triangle Park, North Carolina, 1973. pp.1.6-2.

Woodle, R. A., and W. B. Chandler, Jr. Mechanism of Occurrence of Metals in Petroleum Distillates. Ind. Eng. Chem., 44:2591, 1952.

Yeh, J. T., C. R. McCann, J. J. Demeter, and D. Bienstock. Removal of Toxic Trace Elements from Coal Combustion Effluent Gas. PERC/R1-76/5 Energy Research and Development Administration, Pittsburgh, Pennsylvania, 1976. 21pp.

Yen, T. F. The Role of Trace Metals in Petroleum. Ann Arbor Science, Ann Arbor, California, 1975.

Zoller, W. H., et al. Emissions of Trace Elements from Coal Fired Power Plants. Presented at the Conference on Trace Substances and Environmental Health, 1974.

ENVIRONMENTAL AND HEALTH EFFECTS

Abelson, P. H. Methylmercury. *Science*, 169:1, 1970.

Alberts, J. J., J. Burger, S. Kalthorn, C. Seils, and T. Tissue. Relative Availability of Selected Trace Elements from Coal Fly Ash and Lake Michigan Sediment. CONF-771072-7. Presented at the International Conference on Nuclear Methods in Environmental and Energy Research, Columbia, Missouri, 1977. 17pp.

Allaway, W. H. Control of the Environmental Levels of Selenium in Trace Substances. *Environmental Health*, 2:181-205, 1969.

Altschuler, Z. S. Coal Resources - A Continuing Assessment. In: 5th AIChE National Conference Proceedings on Energy and the Environment, Cincinnati, Ohio, 1977. pp.249-263.

Amdur, M. O., and M. Corn. The Irritant Potency of Zinc Ammonium Sulfate of Different Particle Sizes. *Am. Ind. Hyg. Assoc. J.*, 24:326-333, 1963.

American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio, 1974.

Anderson, W. L., and K. E. Smith. Dynamics of Mercury at Coal-Fired Power Plant and Adjacent Cooling Lake. *Environ. Sci. Technol.*, 11(1):75-80, 1977.

Andren, A. W., D. H. Klein, and Y. Talmi. Selenium in Coal Fired Steam Plant Emissions. *Environ. Sci. Technol.*, 9(9):856-858, 1975.

Arthur, D. Water Quality Criteria Data Book. Little, Inc., 1970.

Auerback, S. I. Trace Contaminants Measurements at and Around the Allen Steam Plant Facility. ORNL-4848, Oak Ridge National Laboratory, Oak Ridge, Tennessee, 1972. pp.53-54.

Awik, J. H., and R. L. Zimdahl. Barriers to Foliar Uptake of Lead. *J. Env. Qual.*, 3:369-373, 1974.

Baker, D. E. Copper: Soil, Water, Plant Relationships. Fed. Proc., 33:1188-1192, 1974.

Ballard, E. G., and G. W. Butler. Mineral Nutrition of Plants. Ann. Rev. Plant Physiol., 17:77-112, 1966.

Bazzaz, F. A., R. W. Carlson, and G. I. Rolfe. The Effect of Heavy Metals on Plants: Part 1, Inhibition of Gas Exchange in Sunflowers by Pb, Cd, Ni, and Tl. Environ. Pollu., 7:241-246, 1974.

Beeson, K. C. Yearbook of Agriculture, Soils. U.S.D.A., 1957. pp.258-267.

Beliles, R. P. Metals. In: Toxicology-The Basic Science of Poisons, L. J. Casarett and J. Doull, eds. Macmillan, New York, 1975. pp.454-502.

Berg, W. A., and W. G. Vogel. Toxicity of Acid Coal-Mine Spoils to Plants. In: Ecology and Reclamation of Devastated Land, Volume I, R. J. Hutnik and G. Davis. Gordon and Breach Science Publishers, New York, New York, 1973.

Berry, W. L., and A. Wallace. Trace Elements in the Environment: Their Role and Potential Toxicity as Related to Fossil Fuels. A Preliminary Study. UCLA-12-946, University of California, Los Angeles, California, 1974. 72pp.

Berry, W. L., and A. Wallace. Trace Elements in the Environment-Their Role and Potential Toxicity as Related to Fossil Fuels. University of California, 1974. pp.1-66.

Biesecker, J. E., and D. K. Liefeste. Water Quality of Hydrologic Bench Marks: An Indicator of Water Quality in the Natural Environment. Circular 460-E, U.S. Geological Survey, Reston, Virginia, 1975.

Bond, R. G., C. P. Straub, and R. Prober, eds. Handbook of Experimental Control, Volume 1: Air Pollution. The Chemical Rubber Co., Cleveland, Ohio, 1972.

Brady, N. C. The Nature and Property of Soils. 8th Edition, Macmillan Publishing Co., New York, 1974. 639pp.

Brain, J. D. The Effects of Increased Particles on the Number of Alveolar Macrophages. In: Inhaled Particles III, Volume I, W. H. Walton, ed. Unwin Bros. Ltd., Surrey, England, 1971. pp.105-122.

Brooks, B. R., and M. G. Rumsby. The Biogeochemistry of Trace Element Uptake by Some New Zealand Bivalves. Limnol. Oceanog., 10:521-527, 1965.

Brown, R., M. L. Jacobs, and H. E. Taylor. Most Recent Applications of Spark Source Mass Spectrometry. Int. Lab., :32-41, 1973.

Buchanan, W. D. Toxicity of Arsenic Compounds. Elsevier Publishing Co., New York, 1962.

Burton, C. A., D. J. Quinn and Y. C. Ng. Concentration Factors of Chemical Elements in Edible Aquatic Organisms. Lawrence Livermore Laboratory, Livermore, California. UCRL-50564 (Rev. 1), 1972.

Cadmium and Cadmium Compounds. In: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Some Inorganic and Organometallic Compounds, Volume 2, IARC, eds., 1973. pp.74-99.

Carlberg, J. R., J. V. Crable, L. P. Limtiaca, H. B. Norris, J. L. Holtz, P. Mauer, and F. R. Wolowicz. Total Dust, Coal, Free Silica, and Trace Metal Concentrations in Bituminous Coal Miner's Lungs. Am. Ind. Hyg. Assoc., 32(7):432-440, 1971.

Celschlager, W. Determination of Fluoride Standards for Vegetation and Animals. Fluoride, 5(3):111-114, 1972.

Chapman, H. D. Zinc. In: Diagnostic Criteria for Plants and Soils, H. D. Chapman, ed. University of California, 1966.

Chau, Y. K., and J. P. Riley. The Determination of Selenium in Seawater, Silicates and Marine Organisms. Anal. Chim. Acta, 33:36-49, 1965.

Chrisp, C. E., G. L. Fisher, and J. E. Lambert. Mutagenicity of Filtrates from Respirable Coal Fly Ash. Science, 199:73, 1978,

Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. NIOSH 76-191, Tracor Jitco Inc., Rockville, Maryland, 1976.

Cleland, J. G., and G. L. Kingsbury. Multimedia Environmental Goals for Environmental Assessment. EPA 600/7-77-136a, b, Research Triangle Institute, Research Triangle Park, North Carolina, 1977.

Comar, C. L., and L. A. Sagan. Health Effects of Energy Production and Conversion. Ann. Rev. Ener., 1:581, 1976.

Copeland, R. Selenium: The Unknown Pollutant. Limnos, 3:7-9, 1970.

Cralley, L. Epidemiologic Studies of Occupational Diseases. In: Industrial Environmental Health: The Worker and the Community, L. V. Cralley, ed. Academic Press, New York, New York, 1972. pp.1-69.

Davison, R. L., D. F. S. Natusch, J. R. Wallace, and C. A. Evans, Jr. Trace Elements in Fly Ash. Dependence of Concentration on Particle Size. Environ. Sci. Technol., 8(13):1107-13, 1974.

De Jong, D., et al. Selenium in Pollen Gathered by Bees Foraging on Fly Ash-Grown Plants. Bull. Environ. Contm. Toxicol., 18(4):442-444, 1977.

Dixon, R. L. Highlights of Neihs Energy-Related Research. Presented at the EPA National Conference on Health, Environmental Effects, and Control Technology of Energy Use, Washington, D.C., 1976.

Doudoroff, P. Water Quality Requirements of Fishes and Effects of Toxic Substances. In: The Physiology of Fishes, M. E. Brown, ed. Academic Press, New York, 1952. pp.403-430.

Dreesen, D. R., E. S. Gladnsy, J. W. Owens, B. L. Perkins, C. L. Wienke, and L. E. Wangen. Comparison of Levels of Trace Elements Extracted from Fly Ash and Levels Found in Effluent Waters from a Coal-Fired Power Plant. Environ. Sci. Technol., 11(10):1017-1019, 1977.

Drinker, K. R., P. K. Thompson, and M. Marsh. Investigation of the Effect Upon Rats of Long-Continued Ingestion of Zinc Compounds, with Special Reference to the Relation of Zinc Excretion to Zinc Intake. Am. J. Physiol., 81:28-306, 1927.

Durocher, N. L. Air Pollution Aspects of Boron and Its Compounds. Litton Systems, Inc., Bethesda, Maryland, 1969. 55pp.

Eisenbud, M. Environmental Protection in the City of New York. Science, 170:706-712, 1970.

Ethyl Corp., eds. A Consideration of the Public Health Aspects of Manganese in the Environment. New Orleans, Louisiana, 1971. 3pp.

Evans, C., B. Bennett, and E. Hardy. Trace Element Metabolic Balances. U.S. Energy Research and Development Administration, New York, New York, 1977.

Fassett, D. W. Cyanides and Nitriles. In: Industrial Hygiene and Toxicology, Second Edition, Volume 2, F. A. Patty, ed. Wiley, New York, New York, 1963.

Federal Water Pollution Control Administration, National Technical Advisory Committee Report. Water Quality Criteria, 1968.

Fennelly, P. F. Primary and Secondary Particulates as Pollutants: A Literature Review. APCA J., 25(7):697-704, 1975.

- Filby, R. H. Elemental Analysis of Human Lung Tissue and Other Selected Samples Utilizing Neutron Activation Analysis. HEW Publ., 75-187, 1975. 9pp.
- Florkin, M., and F. Duchateau. Sur la Distribution Zoologique de la Xanthine Oxydase. Bull. Classe Sci. Acad. Roy. Belg., 27:174-178, 1941.
- Fly Ash Found to be Mutagenic. Chem. Eng. News, 56(2):6-7, 1978.
- Fowler, S. W., and G. Benayoun. Accumulation and Distribution of Selenium in Mussel and Shrimp Tissues. Bull. Environ. Contam. Toxicol., 16(3):339-346, 1976.
- Fowler, S. W., and G. Benayoun. Influence of Environmental Factors on Selenium Flux in Two Marine Invertebrates. Mar. Biol., 37:59-68, 1976.
- Frost, D. V. Arsenicals in Biology-Retrospect and Prospect. Fed. Proc., 26:208, 1967.
- Furr, A. K., T. F. Parkinson, W. H. Gutenmann, I. S. Pakkala, and D. J. Lisk. Elemental Content of Vegetables, Grains, and Forages Field-Grown on Fly Ash Amended Soil. J. Agric. Food Chem., 26(2):357, 1978.
- Ganther, H. E., C. Goudie, M. L. Sunde, M. J. Kopecky, P. Wagner, S. Oh, and W. G. Hoekstra. Selenium: Relation to Decreased Toxicity of Methylmercury Added to Diets Containing Tuna. Science, 175:1122-1124, 1972.
- Gardner, A. W., and P. K. Hall-Patch. An Outbreak of Industrial Molybdenosis. Vet. Rec., 74(4):113-116, 1962.
- Gardner, A. W., and P. K. Hall-Patch. Molybdenosis in Cattle Grazing Downwind from an Oil Refinery Unit. Vet. Rec., 82(3), 1968.
- Gasper, J. R., and P. A. Dauzvarida. Assessment of Trace Element Body Burdens Due to Projected Coal Utilization in the Illinois River Basin. In: Proceedings of the 5th National Conference on Energy and the Environment, American Institute of Chemical Engineers, Cincinnati, Ohio, 1977. pp.350-354.
- Gertsner, H. B., and J. E. Huff. Clinical Toxicology of Mercury. J. Toxicol. and Environ. Hlth., 2(3):491, 1977.
- Gish, C. D., R. E. Christensen. Cadmium, Nickel, Lead and Zinc in Earthworms from Roadside Soil. Environ. Sci. Technol., 7:1060-1062, 1973.
- Gladney, E. S., W. H. Zoller, A. G. Jones, and G. E. Gordon. Composition and Size Distribution of Atmospheric Particulate Matter in Boston Area. Environ. Sci. Technol., 8:551-557, 1974.

- Glass, G. E. Ecological Effects of Coal-Fired Steam-Electric Generating Stations. Presented at the Third National Conference Interagency Engery/ Environment Research and Development Program, Washington, D.C., 1978.
- Goldberg, A. J. A Survey of Emissions and Controls for Hazardous and Other Pollutants. EPA-R4-73-021. Environmental Protection Agency, Washington, D.C., 1973.
- Goldberg, E. D. Biochemistry of Trace Metals. In: Treatise on Marine Ecology and Paleoecology, J. W. Hedgpeth, ed. Geological Society of America Memoir No. 67, 1957. pp.345-357.
- Goldberg, E. D., et al. Marine Chemistry. In: Radioactivity in the Marine Environment. National Academy of Sciences, Washington, D.C., 1971. pp.137-146.
- Goldberg, E. D., W. McBlair, and K. M. Taylor. The Uptake of Vanadium by Tunicates. Biol. Bull., 101:84-94, 1951.
- Graham, J. A. Effect of Nickel Chloride on Primary Antibody Production in the Spleen. Environ. Hlth. Perspect., 12:109-113, 1975.
- Grant, N. Mercury in Man. Environment, 13(4):2-15, 1971.
- Greig, R. A., A. E. Adams, and B. A. Nelson. Uptake of Cadmium by Organs and Tissues, in Physiological Response of the Cunner, Tautogolabrus adspersus to Cadmium. NOAA, 1974. pp.5-9.
- Groth, E. An Evaluation of the Potential for Ecological Damage by Chronic Low Level Environmental Pollution by Fluoride. ISIR Conference, 1974. pp.224-240.
- Gutenmann, W. H., and C. A. Bache. Selenium in Fly Ash. Science, 191:966-967, 1975.
- Guthrie, R. K., and D. S. Cherry. Pollutant Removal from Coal-Ash Basin Effluent. Water Resources Bull., 12(5):889-902, 1976.
- Haas, A. R. C. Nutritional Aspects of Mottleleaf and Other Physiological Diseases of Citrus. Hilgardia, 6:483-559, 1932.
- Hamilton, L. D., and A. S. Manne. Health and Economic Costs of Alternative Energy Sources. CONF-770505-72. Presented at the International Atomic Energy Agency, Vienna, Austrial, 1977.
- Hampel, C. A. The Encyclopedia of Chemical Elements. Rheinhold Book Corporation, New York, New York, 1968.

- Hannerz, L. Experimental Investigations on the Accumulation of Mercury in Water Organisms. Rept. Inst. Freshwater Res., 48:120-176, 1968.
- Hardy, R. W. F., and C. R. Burns. Biological Nitrogen Fixation. Ann. Rev. Biochem., 37:331-358, 1968.
- Hausknecht, D., and R. Ziskind. Health Effects of Selenium. PB-250 568, Science Applications, Inc., El Segundo, California, 1976. 44p..
- Heit, M. Review of Current Information on Some Ecological and Health Related Aspects of the Release of Trace Metals into the Environment Associated with the Combustion of Coal. HASL-320, U.S. Energy Research and Development Administration, New York, 1977. 53pp.
- Helmke, P. A. The Impact of Coal-Fired Power Plants on the Environment-Trace Chemicals Group. University of Wisconsin, Agricultural Experiment Station, Soil Science, Madison, Wisconsin, 1978.
- Hendrickson, E. R. The Fluoride Problem. Paper 12856. In: Proceedings on the Impact of Air Pollution on Vegetation, Canadian Air Management Branch, Toronto, Ontario, 1970. 13pp.
- Hess, L. W., R. L. Brown, and J. F. Heisinger. Mercury Contamination of Birds from a Polluted Watershed. J. Wildlife Manage., 39:299-304, 1975.
- Hickey, R. J., E. P. Schoff, and R. C. Clelland. Relationship Between Air Pollution and Certain Chronic Disease Death Rates. Arch. Environ. Health, 15:728-738, 1967.
- Hildebrand, C. E. Effects of Fossil-Fuel Related Pollutants on Regulation of Gene Structure and Activity. University of California, U.S. D.O.E. Scientific Lab., Los Alamos, New Mexico.
- Holland, W. W., and D. D. Reid. The Urban Factor in Chronic Bronchitis. Lancet, 1:445-448, 1965.
- Horton, J. H., R. S. Dorsett, and R. E. Cooper. Trace Elements in the Terrestrial Environment of a Coal-Fired Powerhouse. DP-1475, Du Pont de Nemours (E.I.) and Co., Aiken, South Carolina, 1976. 53pp.
- How Hazardous are Effluents from Today's Technologies. Environ. Sci. Technol., 12(5):508, 1978.
- Huckabee, J. W. Mosses: Sensitive Indicators of Airborne Mercury Pollution. Atmos. Env., 7:749-54, 1973.
- Huckabee, J. W., and N. A. Griffith. Toxicity of Hg and Se to the Eggs of Carp, Cyprinus Carpio. Trans. Amer. Fish Soc., 103:822-825, 1974.

- Hueper, W. C. Carcinogens in the Human Environment. (Part I). A.M.A. Arch. Pathol., 71:237-267, 1961.
- Hutchinson, T. C., and H. Czyrska. Cadmium and Zinc Toxicity and Synergism to Floating Aquatic Plants. Water Poll. Res., 7:59-65, 1972.
- International Agency for Research on Cancer. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Volume 11. World Health Organization, Geneva, 1976.
- Jacobs, M. B. Air Pollution and Its Relation to Pulmonary Disease. Archiv. Hig. Rada. Toksikol., 16(3):267-284, 1965.
- John, M. K. Lead Availability Related to Soil Properties and Extractable Lead. J. Environ. Qual., 1:295-298, 1972.
- John, M. K., C. J. Van Laerhoven, and H. H. Chuah. Factors Affecting Plant Uptake and Phytotoxicity of Cadmium Added to Soils. Environ. Sci. Technol., 6:1005-1009, 1972.
- Kaakinen, J. W., R. M. Jorden, M. H. Lawasani, and R. E. West. Trace Element Behavior in a Coal-Fired Power Plant. Am. Chem. Soc. Div. Environ. Chem. Prepr., 15(1):136-138, 1975.
- Keenan, R. G., et al. Chemical Composition of the Coal Miners Lung. Am. Ind. Hyg. Assoc. J., 32(6):392-397, 1971.
- Kessler, T., A. G. Sharkey, Jr., and R. A. Friedel. Analysis of Trace Elements in Coal By Spark-Source Mass Spectrometry. RI 7714, U.S. Bureau of Mines, Pittsburgh, Pennsylvania, 1973. 11pp.
- Ketchum, B. H., and V. T. Bowen. Biological Factors Determining the Distribution of Radioisotopes of the Sea. In: Proceedings of the Second International Conference on the Peaceful Uses of Atomic Energy, Geneva, Switzerland, September 1958. United Nations, New York, 1958. pp.429-433.
- Klein, D. H., and P. Russell. Heavy Metals: Fallout Around a Power Plant. Environ. Sci. Technol., 7(4):357-358, 1973.
- Koeman, J. H., W. S. M. van de Ven, J. J. M. de Goeij, P. Tjioe, and J. L. van Haaften. Mercury and Selenium in Marine Mammals and Birds. Science Total Environ., 3:279-287, 1975.
- Krenkel, P. A. Mercury: Environmental Considerations. CRC Crit. Rev. Environ. Control, 251-339, 1974.
- Krickenberger, K. R. Development Document for Effluent Limitations Guidelines and New Source Performance Standard for the Cu, Ni, Cr, and Zn Segment of the Electroplating Point Source Category, 1974. pp.1-21.

- Kubota, J., E. R. Lemon, and W. H. Allaway. The Effect of Soil Moisture Content Upon the Uptake of Molybdenum, Copper, and Cobalt by Alsike Clover. *Soil Sci. Amer. Proc.*, 27:679, 1963.
- Kubota, J., V. A. Lazar, G. H. Simonson, and W. W. Hill. The Relationship of Soils to Molybdenum Toxicity in Grazing Animals in Orgeon. *Soil Sci. Soc. Am. Proc.*, 31:667-671, 1967.
- Lagerwerff, J. V. Lead, Mercury, and Cadmium as Environmental Contaminants. Micronutrients in Agriculture. J. J. Mortvedt, P. M. Giordino, and W. L. Lindsay, eds. *Soil Sci. Amer., Inc., Madison, Wisconsin*, 1972. pp.593-637.
- Lake, P. S., and V. J. Thorp. The Gill Lamellae of the Shrimp *Paratya tasmaniensis*, Normal Ultrastructure and Charges with Low Levels of Cadmium. In: *Eight International Congress on Electron Microscopy, Canberra, Volume 2*, 1974. pp.448-449.
- Lambert, P. M., and D. D. Reid. Smoking, Air Pollution, and Bronchitis in Britain. *Lancet*, 1:853-857, 1970.
- Lave, L. B., and L. C. Freeburg. Health Effects of Electricity Generation from Coal, Oil, and Nuclear Fuel. *Nucl. Saf.*, 14(5):409-428, 1973.
- Lawther, P. J. Climate Air Pollution, and Chronic Bronchitis. *Proc. Roy. Soc. Med.*, 51:262-264, 1958.
- Leeper, G. W. Factors Affecting Availability of Inorganic Nutrients in Soils, with Special Reference to Micronutrient Metals. *Ann. Rev. Plant Physiol.*, 25:736-747, 1952.
- Lewis, R. A., N. R. Glass, and A. L. Lefohn. The Bioenvironmental Impact of a Coal-Fired Power Plant, Colstrip, Montana: June 1975. EPA 600/3-76-013, PB-252 177, Environmental Protection Agency, Corvallis, Oregon, 1976. 333pp.
- Liebig, F. G. Jr., A. P. Vanselow, and H. D. Chapman. Effects of Aluminum on Copper Toxicity, as Revealed by Solution-Culture and Spectrographic Studies of Citrus. *Soil Sci.*, 53:341-351, 1942.
- Lippmann, M., R. E. Albert, and H. T. Peterson. The Regional Deposition of Inhaled Aerosols in Man. In: *Inhaled Particles, III, Volume I*, W. H. Walton, ed. Unwin Bros. Ltd., Surrey, England, 1971. pp.105-122.
- Lisk, D. J. Trace Metals in Soils, Plants, and Animals. *Advan. in Agron.* 24:267-325, 1972.

- Little, P., and M. H. Martin. A Survey of Zinc, Lead, and Cadmium in Soil and Natural Vegetation Around a Smelting Complex. *Env. Pollut.*, 3:240-54, 1972.
- Lowman, F. G., T. R. Rice, and F. A. Richards. Accumulation and Redistribution of Radionuclides by Marine Organisms. In: *Radioactivity in the Marine Environment*. National Academy of Sciences, Washington, D.C., 1971. pp.161-191.
- Lucas, H. F. Jr., D. N. Edington, and P. J. Colby. Concentrations of Trace Elements in the Great Lakes' Fishes. *J. Fish. Res. Bd. Canada*, 27:677-684, 1970.
- MacKay, N. J., M. N. Kazacos, R. J. Williams, and M. I. Leedow. Selenium and Heavy Metals in Black Marlin. *Mar. Pollut. Bull.*, 6:57-61, 1975.
- Mahaffey, K. R., P. E. Corneliussen, C. F. Jelinek, and J. A. Fiorino. Heavy Metal Exposure from Foods. *Environ. Hlth. Persp.*, 12:63-69, 1975.
- Mann, R. M., R. A. Magee, R. V. Collins, M. P. Fuchs, and F. G. Mesich. Trace Element Study of Fly Ash: Emissions from Coal-Fired Steam Plants Equipped with Hot-Side and Cold-Side Electrostatic Precipitation for Particulate Removal. EPA 908/4-78-008. Radian Corp., Austin, Texas, 1978.
- Matti, C. S., J. P. Witherspoon, and B. G. Blaylock. Cycling of Hg and Cd in an Old Field Ecosystem During One Growing Season. Oak Ridge National Lab., Oak Ridge, Tennessee, 1975. pp.1-75.
- McBride, J. P., R. E. Moore, J. P. Witherspoon, and R. E. Blanco. Radiological Impact of Airborne Effluents of Coal and Nuclear Plants. *Science*, 202:1045, 1978.
- McKee, J. E., and H. W. Wolf, eds. *Water Quality Criteria*, 2nd Edition. California State Water Quality Control Board, Sacramento, California, 1963. p.548.
- Mertz, W. Biological Role of Chromium. *Fed. Proc.*, 26:186, 1967.
- Metals Focus Shifts to Cadmium. *Environ. Sci. Technol.*, 5(9):754-755, 1971.
- Michael, L. W., et al. Interaction of Metal Binding Agents from Combustion Products with Trace Metals. *Trace Subst. Environ. Hlth.*, 9:355-360, 1975.
- Miller, W. J. Cadmium Absorption, Tissue and Product Distribution, Toxicity Effects and Influence on Metabolism of Certain Essential Elements. In: *Proceedings Georgia Nutrition Conference*, Athens, Georgia, 1971. pp.58-60.

- Miner, S. Preliminary Air Pollution Survey of Barium and Its Compounds: A Literature Review. APTD 69-28, Litton Systems, Inc., 1969.
- Moiseev, P. A., and A. V. Kardashev. Radioactivity of Certain Marine Life. In: Radioactive Contamination of the Sea, Academy of Sciences, USSR, Moscow, 1964.
- Montague, P. Statement of Peter Montague, Southwest Research and Information Center, Albuquerque, New Mexico. In: Problems of Electrical Power Production in the Southwest. Part I. 92nd Congress (Senate), 1st Session, 1971. pp.156-166.
- Morris, V. C., and O. A. Levander. Selenium Content of Foods. J. Nutrition, 100:1385-1388, 1970.
- Motto, H. L., R. H. Daines, D. M. Chilko, and C. K. Motto. Lead in Soils and Plants: Its Relationship to Traffic Volume and Proximity to Highways. Environ. Sci. Technol., 4:231-237, 1970.
- Mount, D. I. The Effect of Total Hardness and pH on Acute Toxicity of Zinc to Fish. Air Water Pollut. Int. J., 10:49-56, 1966.
- Muir, A., ed. Geochemistry. Oxford University Press, 1954.
- Nash, T. H. Influence of Effluents from a Zinc Factory on Lichens. Ecol. Mono., 45:183-198, 1975.
- National Institute for Occupational Safety and Health. Criteria for a Recommended Standard: Occupational Exposure to Isopropyl Alcohol. NIOSH 76-142, U.S. Government Printing Office, Washington, D.C., 1976.
- Newkirk, H. W. Environmental Effects of Energy Production and Utilization in the U.S., Volume 2: Public Health Effects. UCRL-51930, Lawrence Livermore Lab., 1976. pp.1-120.
- Nielsen, S. W. Environmental Pollutants Pathogenic to Animals. J. Am. Vet. Med. Assoc., 159(9):1103-1107, 1971.
- Nilsson, R. Aspects of the Toxicity of Cadmium and Its Compounds. Swedish Natural Science Council, Stockholm, Sweden, 1970. p.58.
- Noyman, J. Assessing the Chain: Energy Crisis, Pollution and Health. Int. Statist. Rev., 43(3):253-267, 1975.
- Patty, F. A. Arsenic, Phosphorus, Selenium, Sulfur, and Tellurium. In: Industrial Hygiene and Toxicology, Second Revised Edition, Volume 2, F. A. Patty, ed. Wiley, New York, New York, 1963.

Penrose, W. R. Arsenic in the Marine and Aquatic Environment: Analysis, Occurrence, and Significance. CRC Crit. Rev. Environ. Control, 4:465-482, 1972.

Petrilli, F. L., G. Agnese, and S. Kanitz. Epidemiologic Studies of Air Pollution Effects in Genoa, Italy. Arch. Environ. Health, 12:733-740, 1966.

Pickering, Q. H., and C. Henderson. The Acute Toxicity of Some Heavy Metals to Different Species of Warm Water Fishes. J. Air Wat. Pollut., 10:453-463, 1966.

Porter, E. K., and P. J. Peterson. Arsenic Accumulation by Plants on Mine Waste. Sci. Total. Environ., 4:365, 1975.

Pratt, P. F. Vanadium. In: Diagnostic Criteria for Plants and Soils. H. D. Chapman, ed. University of California, 1966. pp.136-141.

Preliminary Investigation of Effects on the Environment of Boron, Indium, Nickel, Selenium, Tin, Vanadium, and Their Compounds, Volume 3, Nickel. EPA 560/2-75-005C. pp.1-89.

Pringle, B. H., D. E. Hissong, E. L. Katz, and S. T. Mulawka. Trace Metal Accumulation by Estuarine Mollusks. J. Sanit. Eng., 94:455-475, 1968.

Prival, M. J., and F. Fisher. Fluorides in the Air. Environment, 15(3):25-32, 1973.

Purves, D. Trace Element Contamination of the Environment. Elsevier North-Holland, Inc., New York, New York, 1977.

Raridon, R. J. Pathways of Trace Elements in the Environment. Presented at the AAAS Conference, Denver, Colorado, 1977. 19pp.

Ratsch, H. C. Heavy Metal Accumulation in Soil and Vegetation from Smelter Emissions. EPA 600/13-74-012, 1974. pp.1-23.

Ricks, G. R., and R. H. J. Williams. Effects of Atmospheric Pollution on Deciduous Woodland, Part 2, Effects of Particulate Matter Upon Stomatal Diffusion Resistance in Leaves of Quercuspetraea (Mattuschka). Liebl. Env. Pollut., 6:87-109, 1974.

Roffman, H. K., R. E. Kary, and T. Hudgins. Ecological Distribution of Trace Elements Emitted by Coal-Burning Power Generating Units Employing Scrubbers and Electrostatic Precipitators. In: Papers from the Symposium on Coal Mine Drainage Research, 1977. National Coal Association, Washington, D.C., 1977. pp.192-215.

- Romney, E. M., and J. D. Childress. Effects of Beryllium in Plants and Soil. *Soil Sci.*, 100:210-217, 1965.
- Romney, E. M., J. D. Childress, and G. V. Alexander. Beryllium and the Growth of Bush Beans. *Science*, 135:786, 1962.
- Ruhling, A., and G. Tyler. Heavy Metal Pollution and Decomposition of Spruce Needle Litter. *Oikos*, 24:402-416, 1973.
- Sandholm, M., H. E. Oksanen, and L. Pesonen. Uptake of Selenium by Aquatic Organisms. *Limnol. Oceanogr.*, 18:496-499, 1974.
- Saward, D., A. Stirling, and G. Topping. Experimental Studies on the Effects of Copper on a Marine Food Chain. *Mar. Biol.*, 29:351-361, 1965.
- Sax, N. I., ed. Dangerous Properties of Industrial Materials, 4th Edition. Van Nostrand Reinhold Co., New York, New York, 1975.
- Schinella, R. A. Particulate Environmental Matter as Seen in Lung Sections. *Hum. Path.*, 7(2):223-229, 1976.
- Schroeder, H. A. Metals in the Air. *Environment*, 13:18-32, 1971.
- Schroeder, H. A., and J. J. Balassa. Abnormal Trace Metals in Man: Arsenic. *J. Chron. Diseases*, 19:85-106, 1966.
- Schulte, H. F. Effects of Chemical Pollutants on Man, Now and in the Future. In: *Energy and the Environment-Cost Benefit Analysis*, R. A. Karam and K. J. Morgan, eds. Pergamon Press, Elmsford, New York, 1976. pp.330-344.
- Schulz-Baldes, M. Lead Uptake from Seawater and Food and Lead Loss in the Common Mussel *Mytilus edulis*. *Mar. Biol.*, 25:177-193, 1974.
- Schuth, C. K., A. R. Isensee, E. A. Woolsen, and P. C. Kearney. Distribution of ^{14}C and Arsenic Derived from ^{14}C -Cadodylic Acid in an Aquatic Ecosystem. *J. Agr. Food Chem.*, 22:999-1003, 1974.
- Shakman, R. A. Nutritional Influence on the Toxicity of Environmental Pollutants. *Arch. Environ. Health*, 28:105-113, 1974.
- Shepard, T. H. Catalog of Teratogenic Agents. Johns Hopkins University Press, Baltimore, Maryland, 1973.
- Skidmore, J. F. Toxicity of Zinc Compounds to Aquatic Animals with Special Reference to Fish. *Quart. Rev. Biol.*, 39:227-248, 1964.

Spigarelli, S. A., J. S. Marshall, and D. L. Mellinger. Great Lakes-Effects on Zooplankton by Energy-Related Pollutants. Argonne National Laboratory, Argonne, Illinois, 1977.

Stahl, Q. R. Preliminary Air Pollution Survey of Selenium and Its Compounds: A Literature Review. APTD 69-49, Litton Systems, Inc, 1969.

Stahl, Q. R. Preliminary Air Pollution Survey of Mercury and Its Compounds: A Literature Review. APTD 69-40, Litton Systems, Inc., 1969.

Stark, N. B., and P. F. Harris. Studies of Trace Elements in Soils and Plants from the Four Corners Area of New Mexico. (Final Report). EPA-R4-72-007, PB-212 561, University of Nevada, Reno, Nevada, 1972.

Stenstrom, T. Cadmium Availability to Wheat: A Study with Isotope Tracers Under Field Conditions. Ambio, 3:87-90, 1974.

Stokinger, H. E. The Metals (Excluding Lead). In: Industrial Hygiene and Toxicology, Second Revised Edition, Volume 2, F. A. Patty, ed. Wiley, New York, New York, 1963.

Stopford, W., and L. J. Goldwater. Methylmercury in the Environment: A Review of Current Understanding. Environ. Health Perspec., 12:115-118, 1975.

Strojan, C. L., and F. B. Turner. Trace Elements and Sulfur in Soils and Plants Near the Mohave Generating Station in Southern Nevada. Presented at the 4th Joint Conference on Sensing of Environmental Pollution, New Orleans, Louisiana, 1977.

Sullivan, R. J. Preliminary Air Pollution Survey of Manganese and Its Compounds: A Literature Review. APTD 69-39, Litton Systems, Inc., 1969.

Sutton, W. L. Heterocyclic and Miscellaneous Nitrogen Compounds. In: Industrial Hygiene and Toxicology, Second Revised Edition, Volume 2, F. A. Patty, ed. Wiley, New York, New York, 1963.

Sweet, D. V., et al. Relationship of Total Dust, Free Silica, and Trace Metal Concentrations to the Occupational Bituminous Coal Miners. Am. Ind. Hyg. Assoc. J., 35(8):479-488, 1974.

Swinehart, J. H., W. R. Biggs, D. J. Halko, and N. C. Schroeder. The Vanadium and Selected Metal Contents of Some Ascidians. Biol. Bull., 146:302-312, 1974.

Task Group on Lung Dynamics. Deposition and Retention Models for Internal Dosimetry of the Human Respiratory Tract. Health Phys., 12:173-207, 1966.

Thurberg, F. P., and R. S. Collier. Respiratory Response of Cunners to Silver. Marine Pollut. Bull., 8:40-41, 1977.

Torrey, S., ed. Trace Contaminants from Coal. Noyes Data Corp., Park Ridge, New Jersey, 1978.

U.S. Environmental Protection Agency. Municipal Sludge Management: Environmental Factors. EPA 430/9-77-004. Washington, D.C., 1977.

U.S. Environmental Protection Agency. Scientific and Technical Assessment Report on Manganese. PB 242 291, 1975.

U.S. Environmental Protection Agency. Water Program, Proposed Toxic Pollutant Effluent Standards. Code Federal Regulations, Title 40, Part 129.

U.S. Environmental Protection Agency. Quality Criteria for Water. EPA 440/9-76-023, 1976.

U.S. Environmental Protection Agency. Scientific and Technical Assessment Report on Cadmium. EPA-600/6-75-003. 1975.

U.S. Environmental Protection Agency. Proposed Criteria for Water Quality, Volume 1. Washington, D.C., 1973.

U.S. National Academy of Sciences, National Research Council. Vapor-Phase Organic Pollutants: Medical and Biological Effects of Environmental Pollutants. Washington, D.C., 1976.

U.S. National Academy of Sciences, National Academy of Engineering. Water Quality Criteria 1972. EPA-R3-73-033. Washington, D.C., 1973.

U.S. National Academy of Sciences, National Research Council. Manganese: Medical and Biological Effects of Environmental Pollutants. Washington, D.C., 1973.

Underwood, E. J. Trace Elements in Human and Animal Nutrition, 3rd ed. Academic Press, Inc., New York, 1971.

Vanselow, A. P. Nickel. In: Diagnostic Criteria for Plants and Soils, H. D. Chapman, ed. University of California, Berkeley, California, 1966. pp.302-309.

Vinogradov, A. P. The Elementary Chemical Composition of Marine Organisms. Yale University, 1953.

Vitez, B. Trace Elements in Flue Gases and Air Quality Criteria. Power Eng., 80(1):56-60, 1976.

- Wagenet, R. J., W. J. Grenney, and J. J. Jurinak. Environmental Transport Model of Heavy Metals. ASCE J. Environ. Eng. Div., 104(1):61-76, 1978.
- Waldbott, G. L. Health Effects of Environmental Pollutants. C. V. Mosby, St. Louis, Missouri, 1973.
- Wallace, R. A., W. Fulkerson, W. D. Shults, and W. S. Lyon. Mercury in the Environment. The Human Element. ORNL-NSF-EP-1, Oak Ridge National Lab., Oak Ridge, Tennessee, 1971. 61pp.
- Watanabe, H. Air Pollution and its Health Effects on Osaka, Paper 65-7. Presented at the 58th Annual Air Pollution Control Association, Toronto, Canada, June 1965.
- Weisburger, E. K. Cancer-Causing Chemicals. Chemistry, 50(1):42, 1977.
- Welch, W. R., and D. L. Dick. Lead Concentrations in Tissues of Roadside Mice. Environ. Pollut., 8:15-21, 1975.
- Wewerka, E. M., J. M. Williams, P. O. Wanek, and J. D. Olsen. Environmental Contamination from Trace Elements in Coal Preparation Wastes. A Literature Review and Assessment. EPA-600/7-76-007, PB-267 339, Los Alamos Scientific Lab., New Mexico, 1976. 69pp.
- Will-Wolf, S. Lichens for Bioassay of SO₂ Emissions. Institute for Environmental Studies, Environmental Monitoring and Data Acquisition Group, Madison, Wisconsin, 1977.
- Wilshire, F. W., J. P. Lambert, and F. E. Butler. Rapid Radiochemical Separation of Selected Toxic Elements in Environmental Samples Prior to Gamma Ray Spectrometry. Anal. Chem., 47(14), 2399, 1975.
- Windholz, M., ed. The Merck Index: An Encyclopedia of Chemicals and Drugs, 9th Edition. Merck & Co., Inc., Rahway, New Jersey, 1976.
- Wood, K. G., W. M. Barnard, J. F. Gaasch, and R. K. Fahnestock. Environmental Impact of Coal Ash on Tributary Streams and Nearshore Water of Lake Erie. EPA IAG-D5-E681, U.S. Dept. of Energy, Washington, D.C., 1978.
- Woolson, E. A. Bound Arsenic Fraction in a Crustacean. Presented at the ACS 168th Meeting, 1974.
- World Health Organization. Evaluation of Certain Food Additives and the Contaminants Mercury, Lead, and Cadmium: 16th Report of the Joint FAO-WHO Expert Committee on Food Additives. WHO Tech. Report No. 505. Geneva, 1972.

Yamagata, N., and I. Shigamatsu. Cadmium Pollution in Perspective.
Inst. Public Health, Tokyo Bull., 19:1-27, 1970.

Zimmerman, P. W., and W. Crocker. Plant Injury Caused by Vapors of
Mercury and of Compounds of Mercury on Plants. Boyce Thompson Inst.,
6:167, 1934.

RADIATION

Bedrosian, P. H., D. G. Easterly, and S. L. Cummings. Radiological Survey Around Power Plants Using Fossil Fuel. EERL-71-3, PB 202 414, Eastern Environmental Radiation Laboratory, Montgomery, Alabama, 1970. 27pp.

Braunstein, H. M., E. D. Copenhauer, and H. A. Pfudener. Environmental, Health and Control Aspects of Coal Conversion: An Information Overview, 2 Volumes. ORNL/EIS-95, Oak Ridge National Laboratory, Oak Ridge, Tennessee, 1977. 1348 pp.

Chamberlain, A. C. Radioactive Aerosols and Vapours. Contemp. Phys., 8(6):561-581, 1967.

Clean Air Act Amendments of 1977. Public Law 95-95, United States Congress, Washington, D.C., August 7, 1977.

Cohen, B. L. Learning to Live with Radiation. Sci. Dig., 77(4):61, 1975.

Coles, D. G., R. C. Ragaini, and J. M. Ondov. Behavior of the Natural Radionuclides in Western Coal-Fired Power Plants. Am. Chem. Soc. Div. Fuel. Chem. Prepr., 22(4):156-161, 1977.

Cooper, B. H. Jr., and G. A. Dakik. Releases of Radioactive Isotopes from Coal and Lignite Combustion, Appendix D. In: Potential for Increased Coal Utilization in the State of Texas, University of Texas, Austin, Texas, 1978. pp.1-31.

Eisenbud, M., and H. G. Petrow. Radioactivity in the Atmospheric Effluents of Power Plants that Use Fossil Fuels. Science, 144:288-289, 1964.

Ferguson, W. S. Appendix 5 to Complete Statement of L. M. Alexander. In: Problems of Electrical Power Product in the Southwest, Part 4, 92nd Congress (Senate), 1st Session, 1971. pp.1435-1444.

Furr, A. K., T. F. Parkinson, R. A. Hinrichs, D. R. van Campen, C. A. Bache, W. H. Gutenmann, and L. E. St. John. National Survey of Elements and Radioactivity in Flyashes: Absorption of Elements by Cabbage Grown in Flyash-Soil Mixtures. Environ. Sci. Technol., 11(13):1194, 1977.

Goldman, M. Impacts of Heavy Metals and Radioactivity from Coal Combustion. UCD--472-124, University of California, Davis, California, 1977.

Hull, A. P. Comparing Effluent Releases from Nuclear and Fossil-Fueled Power Plants. Nucl. News, 17(5):51-55, 1974.

Hull, A. P. Radiation in Perspective: Some Comparisons of the Environmental Risks from Nuclear and Fossil-Fueled Power Plants. Nucl. Saf., 12(3):196, 1971.

Lachapelle, D. G. An Engineering Evaluation of a Radioactive-Waste Incinerator. CONF-660904, In: Proceedings of the 9th Air Cleaning Conference, Atomic Energy Commission, Boston, Massachusetts, 1966, Volume I. pp.509-569.

Lave, L. B., and L. C. Freeburg. Health Effects of Electricity Generation from Coal, Oil, and Nuclear Fuel. Nucl. Saf., 14(5):409-428, 1973.

Lyon, W. S. Nuclear Methods in Coal Combustion Research. CONF-771072-2. Presented at the International Conference on Nuclear Methods in Environmental and Energy Research, Columbia, Missouri, 1977. 9pp.

Martin, J. E., E. D. Hayward, and D. T. Oakley. Comparison of Radioactivity from Fossil-Fuel and Nuclear Power Plants. In: Environmental Effects of Producing Electric Power, Part I. Appendix 14. Committee Print, Joint Committee on Atomic Energy, 91st Congress of the U.S., 1st Session, Washington, D.C., 1969. pp.773-809.

Martin, J. E., E. D. Howard, D. T. Oakley, J. M. Smith, and P. H. Bedrosian. Radioactivity from Fossil-Fuel and Nuclear Power Plants. In: Energy and Humane Welfare: The Social Costs of Power Production, Volume 1, B. Commoner and H. Boksenbaum, eds. Macmillan Information, New York, 1975. pp.103-118.

McBride, J. P. Radiological Impact of Airborne Effluents of Coal-Fired and Nuclear Power Plants. In: Trace Contaminants from Coal, S. Torrey, ed., Noyes Data Corporation, Park Ridge, New Jersey, 1978. pp.121-142

McBride, J. P., R. E. Moore, J. P. Witherspoon, and R. E. Blanco. Radiological Impact of Airborne Effluents of Coal-Fired and Nuclear Power Plants. ORNL-5315, Oak Ridge National Laboratory, Oak Ridge, Tennessee, 1977. 43pp.

McBride, J. P., R. E. Moore, J. P. Witherspoon, and R. E. Blanco. Radiological Impact of Airborne Effluents of Coal and Nuclear Plants. Science, 202:1045, 1978.

Miner, S. Air Pollution Aspects of Radioactive Substances. PH-22-68-25, PB-188 092, Litton Systems, Inc., Bethesda, Maryland, 1966. 159pp.

Moore, G. W. Extraction of Uranium from Aqueous Solution by Coal and Other Materials. Economic Geology Bulletin No. 49, University of North Dakota, Grand Forks, North Dakota, 1954. p.652.

Moore, H. E., and S. E. Poet. Background Levels of ^{226}Ra in the Lower Troposphere. Atmos. Environ., 10(5):381-383, 1976.

Morris, S. C. Comparative Effects of Coal and Nuclear Fuel on Mortality. In: Proceedings of the Statistical Computing Section, American Statistical Association, Chicago, Illinois, 1977. 7pp.

Oak Ridge National Laboratory. Air Surveillance Network, September 1973. Radiation Data Reports, 15(1):22-25, 1975.

Stryon, C. E. Preliminary Assessment of the Impact of Radionuclides in Western Coal on Health and Environment. CONF-780109-1. Presented at Technology for Energy Conservation, U.S. Department of Energy, Albuquerque, New Mexico, 1978. 6pp.

Styron, C. E., and B. Robinson. Preliminary Radiological Impact Assessment of Western Coal Utilization. In: Joint Conference on Sensing of Environmental Pollutants. American Chemical Society, New Orleans, Louisiana, 1977. pp.336-338.

Swanson, V. E., J. H. Medlin, J. R. Hatch, S. L. Coleman, G. H. Wood, Jr., S. D. Woodruff, and R. T. Hildebrand. Collection, Analysis, and Evaluation of Coal Samples in 1975. U.S. Department of the Interior, Geological Survey, 1976.

Terrill, J. G. Jr., E. D. Harward, and I. P. Leggett, Jr. Environmental Aspects of Nuclear and Conventional Power Plants. Ind. Med. Surg., 36:412-419, 1967.

U.S. Environmental Protection Agency. Environmental Radiation Protection Standards for Nuclear Power Operations. In: 40 Code of Federal Regulations Part 190 revised. G.P.O., Washington, D.C., 1978.

U.S. Nuclear Regular Commission. Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low as Practicable" for Radiactive Material in Light-Water Cooled Nuclear Power Reactor Effluents. Code of Federal Regulations, Title 10, Part 50, Appendix I, revised, 1978. pp.369-373.

U.S. Nuclear Regulatory Commission. Concentrations in Air and Water Above Natural Background. Code of Federal Regulations, Title 10, Part 20, Appendix B, Revised, 1978. pp.202-211.

Van Hook, R. I. Potential Health and Environmental Effects of Trace Elements and Radionuclides From Increased Coal Utilization. ORNL--5367, Oak Ridge, National Lab., Oak Ridge, Tennessee, 1978.

Wright, J. H., and H. K. Roffman. Coal Ash--A Potential Mineral Source. In: Proceedings, Environment and Technology, 1976, Philadelphia, Pennsylvania, 1976. Institute of Environment and Science, Mount Prospect, Illinois, 1976. pp.163-173.

ACCURACY OF DATA AND ANALYTICAL TECHNIQUES

American Society for Testing and Materials, Annual Book of ASTM Standards. Race Street, Philadelphia, Pennsylvania.

Andren, A. W., D. H. Klein, and Y. Talmi. Selenium in Coal Fired Steam Plant Emissions. *Environ. Sci. Technol.*, 9(9):856-858, 1975.

Bhardwaja, P. S., J. Herbert, and R. J. Charlson. Refractive Index of Atmospheric Particulate Matter: An In Situ Method for Determination. *Appl. Opt.*, 13(4):731-734.

Birks, L. S., J. V. Gilfrich, and D. J. Nagel. Large Scale Monitoring of Automobile Exhaust Particulate. Memo Report 2350, Naval Research Lab., 1971.

Birks, L. S., J. V. Gilfrich, and P. G. Burkhalter. Development of X-Ray Fluorescence Spectroscopy for Elemental Analysis of Particulate Matter in the Atmosphere and in Source Emissions. EPA-R2-72-063, Environmental Protection Agency, Cincinnati, Ohio, 1972.

Block, C., and R. Dams. Study of Fly Ash Emission During Combustion of Coal. *Environ. Sci. Technol.*, 10(10):1011-1017, 1976.

Bolton, N. E., J. A. Carter, J. F. Emery, et al. Trace Element Mass Balance Around a Coal-Fired Steam Plant. *Adv. Chem. Ser.*, (141):175-187, 1975.

Brown, R., M. L. Jacobs, and H. E. Taylor. Survey of the Most Recent Applications of Spark Source Mass Spectrometry. *Amer. Lab.*, 4(11):29-38, 40, 1972.

Burke, R. W. Absorption Spectrophotometry. COM-74-10469. In: Survey of Various Approaches to the Chemical Analysis of Environmentally Important Materials, B. Greifer and J. K. Taylor, eds., National Bureau of Standards, Washington, D.C., 1973. pp.131-143.

Butcher, S. S., and R. J. Charlson. An Introduction to Air Chemistry. Academic Press, New York, 1972.

Campbell, J. A., J. C. Laul, K. K. Nielson, and R. D. Smith. Separation and Chemical Characterization of Finely-Sized Fly-Ash Particles. *Anal. Chem.*, 50(8):1032-1040, 1978.

Carter, J. A., D. L. Donohue, and J. C. Franklin. Trace Metal Analysis in Coal by Multi-element Isotope Dilution Spark Source Mass Spectrometry. Am. Chem. Soc. Div. Fuel Chem. Prepr., 22(5):60-63, 1977.

Carter, J. A., R. L. Walker, and J. R. Sites. Trace Impurities in Fuels by Isotope Dilution Mass Spectrometry. Am. Chem. Soc. Div. Fuel Chem. Prepr., 18(4):78-91, 1973.

Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. NIOSH 76-191, Tracor Jitco Inc., Rockville, Maryland, 1976.

Coons, J. D., et al. Development Calibration and Use of a Plume Evaluation Training Unit. APCAJ., 15(5):199-203, 1965.

Cooper, J. A., B. D. Wheeler, G. J. Wolfe, D. M. Bartell, and D. B. Schlafke. Determination of Sulfur, Ash and Trace Element Content of Coal, Coke and Fly Ash Using Multielement Tube-Excited X-Ray Fluorescence Analysis. In: Proceedings of ERDA Symposium on X- and Gamma-Ray Sources and Applications, Ann Arbor, Michigan, 1976. ERDA, Washington, D. C., 1976. pp. 169-172.

Crawford, G. M. Preparation of Trace Metals Methods Manual. Radian Corp., Austin, Texas, 1978.

Cunningham, P. T., K. H. Abel, and R. E. Bosshart. Characterization and Analysis. ERDA--77-64. In: Effects of Trace Contaminants from Coal Combustion, R. I. van Hook and W. P. Shults, eds. Energy Research and Development Administration, Washington, D. C., 1977.

Davison, R. L., D. F. S. Natusch, J. R. Wallace, and C. A. Evans, Jr. Trace Elements in Fly Ash. Dependence of Concentration on Particle Size. Environ. Sci. Technol., 8(13):1107-13, 1974.

Dreher, G. B., and J. A. Schleicher. Trace Elements in Coal by Optical Emission Spectroscopy. Adv. Chem. Ser. 141:35-47, 1975.

Edwards, H. A., C. Hill, and W. O. Ursenbach. Application of Scanning Electron Microscopy to Identification and Estimation of Natural and Man-Made Dusts in Arid Regions. Chemosphere, 1(3):107-112, 1972.

Eisenbud, M., and T. J. Kneip. Trace Metals in Urban Aerosols. EPRI-117-FR, PB-248 324, New York University, New York, 1975. 440pp.

Electron Microscopy. Trace Element Measurement in a Coal-Fired Steam Plant, CRC Press, Cleveland, Ohio, 1977. pp.45-49.

Etz, E. S., and G. J. Rosasco. Identification of Small Single Particle with a New Laser Raman Microprobe. Presented at the Inter-Micro-76 meetings, Chicago, Illinois, 1976.

Etz, E. S., G. J. Rosasco, and W. C. Cunningham. The Chemical Identification of Airborne Particles by Laser Raman Spectroscopy. In: Environmental Analysis. Academic Press, New York, 1977. pp.295-340.

Falkenberry, H. L. Emission Controls - Status at Coal Burning Power Plants. Mining Congr. J., 59(5):48-53, 1973.

Fennelly, P. F. Primary and Secondary Particulates as Pollutants: A Literature Review. APCA J., 25(7):697-704, 1975.

Francis, L., and K. M. Chan. Instruments and Methods for Determining Trace Metals. Chem. Technol., 178-182. 1974.

Gallorini, M., and E. Orvini. Determination of Zinc in Environmental Matrices: A Comparison of Results Obtained by Independent Methods. MBS-422. In: Accuracy of Trace Analysis: Sampling, Sample Handling, Analysis, and IMR, Symposium Proceedings, Gaithersburg, Maryland, 1974. pp.239-245.

Gilandi, E. F., and H. F. Schiff. Comparative Results of Sampling Procedures Used during Testing of Prototype Air Pollution Control Devices at New York City Municipal Incinerators. In: Proceedings of the National Incinerator Conference. American Society of Mechanical Engineers, New York, New York, 1972. pp.102-110.

Gluskoter, H. J., et al. Trace Elements in Coal: Occurrence and Distribution. EPA 600/7-77-064, PF-270922, Illinois State Geological Survey, Urbana, Illinois, 1977. 165pp.

Gluskoter, H. J., R. R. Ruch, W. G. Miller, R. A. Cahill, and G. B. Dreher. Trace Elements in Coal: Occurrence and Distribution. Geological Survey Report 499, Illinois State Geological Survey, 1977.

Golightly, D. W. Atomic Emission Spectroscopy. Com-74-10469. In: Survey of Various Approaches to the Chemical Analysis of Environmentally Important Materials, B. Geifer and J. K. Taylor, eds., Nation Bureau of Standards, Washington, D.C., 1973. pp.144-172.

Gordon, G. E., et al. Atmospheric Impact of Major Sources and Consumers of Energy. University of Maryland, College Park, Maryland, 1975.

Gordon, G. E., et al. Study of the Emissions from Major Air Pollution Sources and Their Atmospheric Interactions. University of Maryland, College Park, Maryland, 1974.

Gorsuch, T. T. The Destruction of Organic Matter. Pergamon Press, New York, 1970.

Greifer, B. Introduction. COM-74-10469. In: Survey of Various Approaches to the Chemical Analysis of Environmentally Important Materials, B. Greifer and J. K. Taylor, eds., National Bureau of Standards, Washington, D.C., 1973. pp.1-16.

Greifer, B., and J. K. Taylor. Pollutant Analysis Cost Survey. EPA-650/2-74-125, PB-241 991, National Bureau of Standards, Washington, D.C., 1974. 211pp.

Harris, F., A. Andren, and G. Henderson. Trace Elements from Coal-Plants. ORNL Rev., 8(2):20, 1975.

Hart, F. C., and B. T. DeLaney. The Impact of RCRA (PL 94-580) on Utility Solid Wastes. EPRI FP-878, EPRI TPS 78-779, Fred C. Hart Associates, Inc., New York, 1978.

Jones, P. W., R. D. Giammar, P. E. Strup, and T. B. Stanford. Efficient Collection of Polycyclic Organic Compounds from Combustion Effluents. Environ. Sci. Technol., 10(8):806-810, 1976.

Kaakinen, J. W., R. M. Jorden, M. H. Lawasani, and R. E. West. Trace Element Behavior in Coal Fired Power Plant. Environ. Sci. Technol., 9(9):862-869, 1975.

Karacki, S. S., and F. L. Corcoran, Jr. Coal Ash Analysis with an Argon Plasma Emission Excitation Source. Appl. Spectro., 27(1):41-42, 1973.

Klein, D. H., A. W. Andren, and N. E. Bolton. Trace Element Discharges from Coal Combustion for Power Production. Water, Air, Soil Pollut., 5(1):71-77, 1975.

Klein, D. H., A. W. Andren, J. A. Carter, et al. Pathways of Thirty-Seven Trace Elements through Coal Fired Power Plant. Environ. Sci. Technol., 9(10):973-979, 1975.

Lee, R. E. Jr., and D. J. von Lehmden. Trace Metal Pollution in the Environment. APCA J., 23(10):853-857, 1973.

Lindberg, S. E., A. W. Andren, R. J. Raridon, and W. Fulkerson. Mass Balance of Trace Elements in Walker Branch Watershed: Relation to Coal-Fired Steam Plants. Environ. Hlth. Persp., 12:9-18, 1975.

Linton, R. W., A. Loh, D. F. S. Natusch, C. A. Evans, Jr., and P. Williams. Surface Predominance of Trace Elements in Airborne Particles. Science, 191(4229):852-854, 1976.

Linton, R. W., P. Williams, C. A. Evans, and D. F. S. Natusch. Determination of the Surface Predominance of Toxic Elements in Airborne Particles by Ion Microprobe Mass Spectrometry and Auger Electron Spectrometry. *Anal. Chem.*, 49(11):1514-1520, 1977.

Lisk, D. J. Recent Development in the Analysis of Toxic Elements. *Science*, 184(4142):1137-1141.

Lyon, W. S. Nuclear Methods in Coal Combustion Research. CONF-771072-2. Presented at the International Conference on Nuclear Methods in Environmental and Energy Research, Columbia, Missouri, 1977. 9pp.

Lyon, W. S., and W. J. Ross, eds. Determination of Mercury and Other Elements by Neutron Activation. ORNL-4838. In: *Analytical Chemistry Division Annual Progress Report Ending September 30, 1972*. Oak Ridge National Lab., Oak Ridge, Tennessee, 1973. pp.33-34.

Magee, E. M., H. J. Hall, and G. M. Varga, Jr. Potential Pollutants in Fossil Fuels. EPA-R2-73-249, PB-225 039, ESSO Research and Engineering Co., Linden, New Jersey, 1973. 292pp.

Mann, R. M., R. A. Magee, R. V. Collins, M. P. Fuchs, and F. G. Mesich. Trace Element Study of Fly Ash Emissions from two Coal-Fired Steam Plants Equipped with Hot-Side and Cold-Side Electrostatic Precipitators for Particulate Removal. EPA 908/4-78-008, Radian Corp., Austin, Texas, 1978.

Miner, S. Preliminary Air Pollution Survey of Barium and Its Compounds: A Literature Review. APTD 69-28, Litton Systems, Inc., 1969.

Mizuike, A. Separations and Preconcentrations. In: *Trace Analysis: Physical Methods*, G. H. Morrison, ed. Wiley, New York, New York, 1970.

Natusch, D. F. S. Characterization of Atmospheric Pollutants from Power Plants. In: *Second Federal Conference on the Great Lakes, Proceedings*, J. S. Marshall, ed. 1975. pp.114-129.

Natusch, D. F. S., C. F. Bauer, H. Matusiewicz, C. A. Evans, J. Baker, A. Loh, R. W. Linton, and P. K. Hopke. Characterization of Trace Elements in Fly Ash. In: *International Conference Proceedings on Heavy Metals in the Environment, Volume 2, Part 2*, Toronto, Canada, 1975. pp.553-575.

Neutron Activation Analysis. In: *Trace Element Measurement in a Coal-Fired Steam Plant*, W. S. Lyon. CRC Press, Cleveland, Ohio, 1977. pp.23-31.

Oglesby, S. Jr. A Survey of Technical Information Related to Fine-Particle Control. EPRI 259, Southern Research Institute, Birmingham, Alabama, 1975.

Ondov, J. M., R. C. Ragaini, and A. H. Biermann. Characterization of Trace Element Emissions from Coal-Fired Power Plants. Rept. No: CIBF-661962-6, UCRL-80412. In: International Conference on Nuclear Methods in Environmental and Energy Research. Columbia, Missouri, 1977. 21pp.

Ondov, J. M., W. H. Zoller, I. Olmez, et al. Elemental Concentrations in the National Bureau of Standards' Environmental Coal and Fly Ash Standard Reference Materials. Anal. Chem., 47(7):1102-1109, 1975.

Other Analytical Methods. Trace Element Measurement in a Coal-Fired Steam Plant, CRC Press, Cleveland, Ohio, 1977. pp.51-56.

Pellizzari, E. D., J. E. Bunch, B. H. Carpenter, and E. Sawicki. Collection and Analysis of Trace Organic Vapor Pollutants in Ambient Atmospheres. Environ. Sci. Technol., 9(6):552-555, 1975.

Piperno, E. Trace Element Emissions. Aspects of Environmental Toxicology. Adv. Chem. Ser., (141):192-209, 1975.

Pollock, E. N. Trace Impurities In Coal by Wet Chemical Methods. Adv. Chem. Ser., 141,23-34, 1975.

Pollock, E. N. Trace Impurities in Coal. Am. Chem. Soc. Div. Fuel Chem. Prepr., 18(4):92-105, 1973.

Ragaini, R. C., and J. M. Ondov. Trace Contaminants from Coal-Fired Power Plants. Presented at the International Conference on Environmental Sensing and Assessment, Las Vegas, Nevada.

Research Triangle Institute. Summary of Key Federal Regulations and Criteria for Multimedia Environmental Control. Research Triangle Park, North Carolina, 1977.

Schlesinger, M. D., and H. Schultz. Analysis for Mercury in Coal. PB-204 152, U.S. Bureau of Mines, Pittsburgh, Pennsylvania, 1971. 8pp.

Schwitzgebel, K., F. B. Meserole, R. G. Oldham, R. A. Magee, F. G. Mesich, and T. L. Thoem. Trace Element Discharge from Coal-Fired Power Plants. In: 1st International Conference on Heavy Metals in the Environment, Symposium Proceedings, Volume 2. University of Toronto, Toronto, Ontario, 1975. pp.533-551.

Seader, J. D., and I. N. Einhorn. Some Physical, Chemical, Toxicological, and Physiological Aspects of Fire Smokes. Presented at the 16th International Symposium on Combustion of the Combustion Inst., Cambridge, Massachusetts, 1976. 67pp.

Sheibley, D. W. Trace Element Analysis of Coal by Neutron Activation. N73-21596, NASA, Cleveland, Ohio, 1973. 15pp.

Sheibley, D. W. Trace Elements by Instrumental Neutron Activation Analysis for Pollution Monitoring. Adv. Chem. Ser., 141:98-117, 1975.

Southern Research Institute. Field Measurements of Particle Size Distribution with Internal Sizing Devices. EPA 650/2-73-035. Birmingham, Alabama, 1973.

Southern Research Institute. Particle Sizing Techniques for Control Device Evaluation. EPA 650/2-74-102. Birmingham, Alabama, 1974.

Southern Research Institute. Particle Sizing Techniques for Control Device Evaluation: Cascade Impactor Calibration. EPA 600/2-76-280, Birmingham, Alabama, 1976.

Strojan, C. L., and F. B. Turner. Trace Elements and Sulfur in Soils and Plants Near the Mohave Generating Station in Southern Nevada. Presented at the 4th Joint Conference on Sensing of Environmental Pollution, New Orleans, Louisiana, 1977.

Struempfer, A. W. Trace Metals in Rain and Snow During 1973 at Chardron, Nebraska. Atmos. Environ., 10(1):33-37, 1976.

Suhr, N. H., and H. Gong. Comparison of Atomic Absorption and D. C. Plasma-Arc Spectrometry in Multi-Element Analysis of Coal. Am. Chem. Soc. Div. Fuel Chem. Prepr., 22(5):56-59, 1977.

Swanson, V. E., and C. Huffman. Guidelines for Sample Collecting and Analytical Methods Used in the U.S. Geological Survey for Determining Chemical Composition of Coal. U.S. Geol. Sur. Cir., (735), 1976. 15p.

Swanson, V. E., J. H. Medlin, J. R. Hatch, S. L. Coleman, G. H. Wood, Jr., S. D. Woodruff, and R. T. Hildebrand. Collection, Analysis, and Evaluation of Coal Samples in 1975. U.S. Department of the Interior, Geological Survey, 1976.

Torrey, S., ed. Trace Contaminants from Coal. Noyes Data Corp., Park Ridge, New Jersey, 1978.

U.S. Environmental Protection Agency. Methods of Chemical Analysis of Water and Wastes. EPA 625/6-74-003. Environmental Protection Agency, Office of Technology Transfer, Washington, D.C., 1974.

U.S. National Academy of Science, National Research Council. Ad Hoc Panel on Abatement of Particulate Emission from Stationary Sources, COPAC-5, Washington, D.C., 1972.

von Lehmden, D. J., R. H. Jungers, and R. E. Lee, Jr. Determination of Trace Elements in Coal, Fly Ash, Fuel Oil, and Gasoline-A Preliminary Comparison of Selected Analytical Techniques. *Anal. Chem.*, 46(2):239-245, 1974.

Wilshire, F. W., J. P. Lambert, and F. E. Butler. Rapid Radiochemical Separation of Selected Toxic Elements in Environmental Samples Prior to Gama Ray Spectrometry. *Anal. Chem.*, 47(14), 2399, 1975.

REGULATIONS

Air Quality Implementation Planning Program, Volume I, Operator's Manual. EPA, Washington, D.C., 1970.

American Conference of Governmental Industrial Hygienists. Documentation of the Threshold Limit Values for Substances in Workroom Air with Supplements, Third Edition. American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio, 1974.

Argonne National Labs., Preliminary Assessment of the Health and Environmental Effects of Coal Utilization in the Scenarios Technology Characterizations, Air and Water Resource Impacts, and Health Effects. ANL-77-xx-40(Vol. 1), Argonne, Illinois, 1977.

Bach, W., and A. Daniels. Handbook of Air Quality in the United States. Honolulu, Hawaii, Oriental, 1975.

Barrett, R. E., D. W. Locklin, and S. E. Miller. Investigation of Particulate Emissions from Oil-Fired Residential Heating Units. EPA 650/2-74, Battelle-Columbus Laboratories, Columbus, Ohio, 1974.

Berry, W. L., and A. Wallace. Trace Elements in the Environment: Their Role and Potential Toxicity as Related to Fossil Fuels. A Preliminary Study. UCLA-12-946, University of California, Los Angeles, California, 1974. 72pp.

Berstein, F. H., J. R. Ehrenfeld, and T. R. Parks. Equipment for Intermediate-Size Boilers, pp.72-74. Presented at the Air Pollution Control Association 65th Annual Meeting, Miami, Florida, 1972.

Block, C., and R. Dams. Lead Contents of Coal, Coal Ash and Fly Ash. Water Air Soil Pollut., 5(2):207-211, 1975.

Booz, A., and Hamilton, Inc. Guidelines for Air Quality Maintenance Planning and Analysis, Volume 7, Projecting County Emissions, 2nd Edition, 1975.

Butcher, S. S., and R. J. Charlson. An Introduction to Air Chemistry. Academic Press, New York, 1972.

Carlisle, S. T., J. Norris, A. J. Weir, F. Mesich, and W. F. Holland. Trace Element Leaching from Ash and Scrubber Sludge at Five Generating Stations. In: Proceedings of the 12th Air Pollution Industrial Hygienists Conference on Air Quality Management in the Electric Power Industry, 1976. pp. 283-302.

Cato, G. A. Field Testing: Trace Element and Organic Emissions from Industrial Boilers. EPA 600/2-76-086b, PB-261 263, KVB Engineering, Inc., Tustin, California, 1976. 160pp.

Cherry, D. S., and R. K. Guthrie. Toxic Metals in Surface Waters from Coal Ash. Water Resources Pt. B, 13(6):1227, 1977.

Christensen, H. E., and E. J. Fairchild. Registry of Toxic Effects of Chemical Substances: 1976 Edition. NIOSH 76-191, Tracor Jitco Inc., Rockville, Maryland, 1976.

Clean Air Amendments of 1970, PL 91-604.

Cleland, J. G., and G. L. Kingsbury. Multimedia Environmental Goals for Environmental Assessment. EPA 600/7-77-136a, b, Research Triangle Institute, Research Triangle Park, North Carolina, 1977.

Colley, J. D., et al. Assessment of Technology for Control of Toxic Effluents from the Electric Utility Industry. Radian Corp., Austin, Texas, 1977.

Comparative Risk-Cost-Benefit Study of Alternative Sources of Electrical Energy. Nucl. Saf., 17(2):171-184, 1976.

Crockett, Alan B., and R. R. Kinnison. Mercury Distribution in Soil Around a Large Coal-Fired Power Plant. EPA-600/3-77-063, Environmental Protection Agency, Las Vegas, Nevada, 1977. 9pp.

Dams, R. J., J. A. Robbins, K. A. Rahn, and J. W. Winchester. Quantitative Relationships Among Trace Elements Over Industrialized N.W. Indiana, Paper 1AEA-SM-142a/5. In: Proceedings of the Nuclear-Based Techniques in Environmental Pollution, International Symposium, Salzburg, Austria, 1970. IAEA, Vienna, Austria, 1970. pp.139-157.

Directory of Federal Environmental Research and Development Programs. Government R&D Report, MIT Branch, 1978.

Eimutis, E. C., and R. P. Quill. Source Assessment: Noncriteria Pollutant Emissions. MRC-DA-692, PB-270 550, Monsanto Research Corp., Dayton, Ohio, 1977. 116pp.

Engineering Science, Inc. Exhaust Gases from Combustion and Industrial Processed. PB 204861, Washington, D.C., 1971. 431pp.

Environmental Program Cost is Over \$1,000,000 a week. TVA News, (4516):1-3, 1972.

Fancher, J. R. Trace Element Emissions from the Combustion of Fossil Fuels. In: Proceedings of the Environmental Resources Conference, Cycling Contributions of Metals, 1972. National Environmental Research Center, Cincinnati, Ohio, 1973. pp.109-113.

Fish, F. L., et al. Trends in Pollution Control Laws and Regulations. In: Proceedings of the 2nd Annual American Institute of Plant Engineers Meeting, New England Region, Maintenance Conference, Newton, Massachusetts, 1970. pp.1-36.

Fisher, G. L., B. A. Prentice, and D. Silberman. Morphology and Chemistry of Size-Classified Fly Ash Collected from the Stack of a Coal-Fired. University of California, Radiobiology Laboratory, 1976.

Frankenberg, T. T. Trends in Air Pollution Legislation and in Precipitator Development. Presented at a meeting of the Southeastern Electric Exchange, Miami Beach, Florida, 1965.

Gonze, R. Current Federal Environmental Legislation and Regulation. 1978. 5pp.

Guidelines for the Development of Air Quality Standards and Implementation Plans. USDHEW, PHS, Nat. Air Poll. Contr. Adm., Washington, D.C., 1969.

Hamilton, L. D., and S. C. Morris. Risk Assessment for Energy Technology Development. Presented at the Specialty Conference on Toxic Substances in the Air and the Environment, Cambridge, Massachusetts, 1977.

Hammond, A. L. Energy: Ford Foundation Study Urges Action on Conservation. Science, 186(4162):426-428, 1974.

Hart, F. C., and B. T. DeLaney. The Impact of RCRA (PL 94-580) on Utility Solid Wastes. EPRI FP-878, EPRI TPS 78-779, Fred C. Hart Associates, Inc., New York, 1978.

Haws, R. C., R. E. Paddock, and C. C. Masser. The Regional Air Pollution Study (RAPS) Grid System. EPA 450/3-76-021. Research Triangle Institute and Environmental Protection Agency, Research Triangle Park, North Carolina, 1975.

Hendrickson, E. R. The Fluoride Problem. Paper 12856. In: Proceedings on the Impact of Air Pollution on Vegetation, Canadian Air Management Branch, Toronto, Ontario, 1970. 13pp.

Hooper, T. G., and W. A. Marrone. Impact of New Source Performance Standards on 1985 National Emissions from Stationary Sources, Volume 1, Final Report. TRC, 1975.

Hunt, W. F. Jr., et al. National Air Quality and Emission Trends Report, 1976. Environmental Protection Agency, Office of Air Quality Planning and Standards, Office of Air and Waste Management, 1977.

Irwin, W. A., et al. Economic Disincentives for pollution Control: Legal, Political, and Administrative Disincentives. Environmental Law Institute, 1974.

Jones, C. O. Clean Air: The Policies and Politics of Pollution Control. University of Pittsburgh Press, Pittsburgh, Pennsylvania, 1975.

Jordan, A. R., M. Willrich, J. J. Schanz, R. L. Lowrie, and J. D. Haun. Public Policy Toward Environment 1973: A Review and Appraisal of Fossil Energy. Ann. N.Y. Acad. Sci., 216:63-78, 1973.

Jutze, G. A., and E. C. Tabor. The Continuous Air Monitoring Program. APCA J., 13(6):278-280, 1963.

Kenkeremath, D. C., C. G. Miller, and J. B. Truett. A Program for the Environmental Assessment of Conventional Combustion Processes. EPA-600/7-78-140, Research Triangle Park, North Carolina, 1978.

Lagerwerff, J. V., D. L. Bower, and G. T. Biersdorf. Accumulation of Cadmium, Copper, Lead and Zinc in Soil and Vegetation in the Proximity of a Smelter. In: 6th Annual Conference on Trace Substances and Environmental Health Proceedings, University of Missouri, 1972. pp.71-78.

Leavitt, C., et al. Environmental Assessment of Coal- and Oil-Firing in a Controlled Industrial Boiler; Volume 3. EPA-600/7-78-164c. TRW, Inc., Redondo Beach, California, 1978.

Lee, R. E. Jr., and D. J. von Lehmden. Trace Metal Pollution in the Environment. APCA J., 23(10):853-857, 1973.

Lewis, R. A., A. S. Lefohn, and N. R. Glass. The Ecological Effects of Energy Conversion Activities on the Terrestrial Environment: The Environmental Protection Agency's Program. Presented at the EPA National Conference on Health, Environmental Effects, and Control Technology of Energy Use, Washington, D.C., February 1976.

Lowry, H. H. ed. Chemistry of Coal Utilization, 2 Volumes and Supplement. Wiley, New York, New York, 1945, 1963.

Matle, P. C. Organic Pollutants from Pulverized Coal Combustion (A Review). WSS/CI-77-48. Presented at the Combustion Institute Western States Chapter Meeting, Palo Alto, California, 1977. 26pp.

McGlamery, G. G., R. L. Torstrick, W. J. Broadfoot, et al. Detailed Cost Estimates for Advanced Effluent Desulfurization Processes. Combustion, 47(4):27-36, 1975.

Morgan, G. B., E. C. Tabor, and R. J. Thompson. Atmospheric Surveillance-Past, Present and Future. In: Determination of Air Quality, G. Mamatov and W. D. Shults, eds. Plenum Press, New York, 1972.

Morris, S. C. Comparative Effects of Coal and Nuclear Fuel on Mortality. In: Proceedings of the Statistical Computing Section, American Statistical Association, Chicago, Illinois, 1977. 7pp.

Munshower, F. F., and E. J. Deput. The Effects of Stack Emissions on the Range Resource in the Vicinity of Colstrip, Montana: Progress Report 1975. RR-98, PB 269 120, Montana Agricultural Experiment Station, Bozeman, Montana, 1976. 122pp.

Nation Considers Strip Mining. Environ. Sci. Technol., 8(8):700-701, 1974.

National Air Pollution Control Administration. Control Techniques for Emissions of CO, NO_x, HC, and Organic Solvents. Washington, D.C., 1970.

National Air Pollution Control Administration. Control Techniques for Particulate Matter, and for SO₂, 1969; Control Techniques for Emissions of CO, NO_x, HC, and Organic Solvents, 1970; Control Techniques for Emissions of CO, NO_x, and HC from Mobile Sources, 1970. Washington, D.C.

New Mexico, Health and Environment Department. Implementation Plan for the Attainment and Maintenance of National Ambient Air Quality Standards. Santa Fe, New Mexico, 1979.

Ondov, J. M., R. C. Ragaini, and A. H. Biermann. Characterization of Trace Element Emissions from Coal-Fired Power Plants. CONF-771072-6, UCRL-80412, University of California, Livermore, California, 1978. 21pp.

Paciga, J. J., T. M. Roberts, and R. E. Jervis. Particle Size Distribution of Lead, Bromine, and Chlorine in Urban-Industrial Aerosols. Environ. Sci. Technol., 9(13):1141-1144, 1975.

- Pechan, E. H. 1985 Air Pollution Emissions. DOE/PE--0001. Department of Energy, Washington, D.C., 1977.
- Pedco-Environmental Specialists, Inc. Standards of Performance for New Stationary Sources - A Compilation as of August 1976. EPA 340/1-7-009, PB-275 6652 Cincinnati, Ohio, 1976. 340pp.
- Phillips, M. A. Investigations into Levels of Both Airborne Beryllium and Beryllium in Coal at the Hayden Power Plant near Hayden, Colorado. Environ. Lett., 5(3):183-188, 1973.
- Radian Corp. Field Testing and Laboratory Studies for the Development of Effluent Standards for the Steam Electric Power Industry. Austin, Texas, 1978.
- Ragaini, R. C., and J. M. Ondov. Trace Contaminants from Coal-Fired Power Plants. Presented at the International Conference on Environmental Sensing and Assessment, Las Vegas, Nevada.
- Reiquam, H., N. Dee, and P. Choi. Assessing Cross Media Impacts. Environ. Sci. Technol., 9(2):118-120, 1975.
- Resource Conservation and Recovery Act of 1976. C.P.O., Washington, D.C., 1976.
- Robinson, M. A Survey of Current U.S. and European Literature on Air Pollutants and Cinders from Large, Coal-Fired Boilers: Control Technology and Regulatory Aspects of Sulfur Oxides, Nitrogen Oxides, and Particulate, and Disposal of Cinders. Franklin Inst. Research Labs., 1798. 45pp.
- Rubin, E. S. A Systematic Approach to Characterizing Energy-Environment Tradeoffs for Coal Utilization Technologies. In: Energy and the Environment, Proceedings of the Fifth National Conference, Cincinnati, Ohio, 1977, D. G. Nichols, et al., eds. AIChE, Dayton, Ohio, 1978. pp.124-131.
- Simon, C. Federal Regulations Relating to Stationary Combustion Sources. Presented at the Air Pollution Control Association Proceedings, Mid-Atlantic States Session, Edison, New Jersey, 1972. 15pp.
- Smil, V. Energy and Air Pollution: USA 1970-2020. APCA J., 25(3):233-236, 1975.
- Stein, A. Guide to Engineering Permit Processing. APTD-1164, Pacific Environmental Services, Inc., Santa Monica, California, 1972. 380pp.
- Summary of Air Quality Control Regions (Interim Report). Air Poll. Contr. Office, EPA, April 1971.

Switch Back to Coal Puts Renewed Emphasis on Particulate Removal. Power, 119(11):41-48, 1975.

TRW Systems Group. Air Quality Implementation Planning Program, 2 Volumes. 1970.

U.S. Environmental Protection Agency. State Air Pollution Implementation Plan Progress Report, January 1 to June 30, 1975. Washington, D.C., 1975.

U.S. Environmental Protection Agency. Federal Register 38(111), June 11, 1973, and 39(47), March 8, 1974. Washington, D.C.

U.S. Environmental Protection Agency. Federal Register 36(158), August 14, 1971 and 38(147), August 1, 1973. Washington, D.C.

U.S. Environmental Protection Agency. National Primary and Secondary Ambient Air Quality Standards for Lead. Fed. Reg., 43(194):46246-46277, 1978.

U.S. Environmental Protection Agency. EPA Activities Under the Resource Conservation and Recovery Act of 1976, Annual Report to the President and the Congress, Fiscal Year 1977. Washington, D.C., 1978.

U.S. Environmental Protection Agency. Guidelines for the Interpretation of Air Quality Standards. 1977.

U.S. Environmental Protection Agency. Guidelines for Designation of Air Quality Maintenance Areas, Vol. I, 1974.

U.S. Environmental Protection Agency. Proposed National Emission Standards for Hazardous Air Pollutants: Asbestos, Beryllium, Mercury. Research Triangle Park, North Carolina, 1971.

U.S. Environmental Protection Agency. Compilation of Air Pollution Emission Factors and Supplements, 2nd ed. AP-42, Research Triangle Park, North Carolina, 1973.

U.S. Environmental Protection Agency. Data from Compliance Data System. Washington, D.C., 1977.

U.S. Environmental Protection Agency. National Air Quality and Emission Trends Report, 1975. EPA-450/1-76-002, Research Triangle Park, North Carolina, 1976.

U.S. Environmental Protection Agency. Federal Air Quality Control Regions. Rockville, Maryland, 1972.

- U.S. Environmental Protection Agency. Air Quality Criteria for Nitrogen Oxides. Washington, D.C., 1971.
- U.S. Environmental Protection Agency. Data from Energy Data System. Research Triangle Park, North Carolina, 1977.
- U.S. Environmental Protection Agency. Data from National Emissions Data System. Research Triangle Park, North Carolina, 1977.
- U.S. National Air Pollution Control Administration. Air Quality Criteria for Particulate Matter, and for Sulfur Oxides, Arlington, Virginia, 1969.
- U.S. National Air Pollution Control Administration. Air Quality Criteria for Carbon Monoxide, for Hydrocarbon, and for Photochemical Oxidants. Washington, D.C., 1970.
- U.S. Senate Committee on Public Works. A Legislative History of the Energy Supply and Environmental Coordination Act of 1974, Volume 1. Report 94-7, Washington, D.C., 1976.
- U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 3rd Edition. AP-42, Research Triangle Park, North Carolina, 1977.
- U.S. Environmental Protection Agency. Performance Standards for New Stationary Sources. Environ. Report., 2(16):477-495, 1971.
- Wagenet, R. J., W. J. Grenney, and J. J. Jurniak. Erosion Model for Arid Wildland Watersheds. Paper 77-2510. Presented at the ASAE Winter Meeting, Chicago, Illinois, 1977. 23pp.
- Walsh, G. W., and D. V. von Lehmden. Resources for Air Quality Controls Regions. Presented at the NAPCA Workshop on Regional Implementation Plans, 1969.
- York, J. L. Environment vs. Western Coal. GFERC/IC-75/2. In: Proceedings of the Symposium on Technology and Use of Lignite, Grand Forks, North Dakota, 1975. ERDA, Oak Ridge, Tennessee, 1975. pp.193-201.

RESEARCH NEEDS

Amr, A. T., et al. Evaluation of Environmental Aspects of Selected R,D&D Processes within the ERDA Fossil Energy Program. Mitre Corp., Metrek Div., McLean, Virginia, 1977.

Argonne National Labs, (USA). Balanced Program Plan: Analysis for Biomedical and Environmental Research, Volume 3, Coal Combustion. ERDA--116, Argonne, Illinois, 1976.

Cheney, E. S. Limits on Energy Supply. Chem. Tech., 370-374, 1975.

Cho, P., and J. H. Chambers. Municipal Refuse: An Alternate Energy Resource in Power Plants. In: Energy and the Environment, Proceedings of the Fourth National Conference, Cincinnati, Ohio, 1976. AIChE, Dayton, Ohio, 1976. pp.204-211.

Comar, C. L., and L. A. Sagan. Health Effects of Energy Production and Conversion. Ann. Rev. Ener., 1:581, 1976.

Comar, C. L., and N. Nelson. Health Effects of Fossil Fuel Combustion Products Report of a Workshop in Indian Wells. PB-242 418, EPRI-SR-11, Electric Power Research Institute, Palo Alto, California, 1975.

Devitt, T. W., C. J. Sawyer, and F. D. Hall. State-of-the-Art Assessment of Air Pollution Control Technologies for Various Waste-as-Fuel Processes. In: Energy and the Environment, Proceedings of the Fifth National Conference, Cincinnati, Ohio, 1977, D. G. Nichols, et al., eds. AIChE, Dayton, Ohio, 1978. pp.167-173.

Directory of Federal Environmental Research and Development Programs. Government R&D Report, MIT Branch, 1978.

Edwards, L. O. Potential Applications of Photo-Acoustical Spectroscopy at Radian. DCN 78-290-403-46-01, Radian Corp., Austin, Texas, 1978.

Ermak, D. L., J. R. Kercher, and D. L. Pitschard. Comprehensive Approach for Evaluating the Environmental and Human Health Effects of Coal-Fired Electricity Production in the Southwest. UCRL--77303, CONF-751118-1, University of California, Livermore, California, 1975.

Etz, E. S., G. J. Rosasco, and W. C. Cunningham. The Chemical Identification of Airborne Particles by Laser Raman Spectroscopy. In: Environmental Analysis. Academic Press, New York, 1977. pp.295-340.

Gaspar, J. R., and P. A. Dauzvarida. Assessment of Trace Element Body Burdens Due to Projected Coal Utilization in the Illinois River Basin. In: Proceedings of the 5th National Conference on Energy and the Environment, American Institute of Chemical Engineers, Cincinnati, Ohio, 1977. pp.350-354.

Gibson, R. L. Toxicity of Coal and Shale Process Materials. In: Proceedings of the 42nd American Petroleum Institute, Chicago, Illinois, 1977. American Petroleum Institute, Chicago, Illinois, 1977. American Petroleum Institute, Washington, D.C., 1977. pp.368-375.

Golightly, D. W. Atomic Emission Spectroscopy. Com-74-10469. In: Survey of Various Approaches to the Chemical Analysis of Environmentally Important Materials, B. Geifer and J. K. Taylor, eds., Nation Bureau of Standards, Washington, D.C., 1973. pp.144-172.

Hall, E. H., C. M. Allen, D. A. Ball, J. E. Burch, H. N. Conkle, W. T. Lawhon, T. J. Thomas, and G. R. Smithson, Jr. Comparison of Fossil and Wood Fuels, Final Report. EPA 600/2-76-056, PB 251 622, Battelle-Columbus Laboratory, Columbus, Ohio, 1976.

Hall, H. J., G. M. Varga, and E. M. Magee. Trace Elements and Potential Pollutant Effects in Fossil Fuels. EPA-650/2-74-118, Exxon Research Engineering Co., Linden, New Jersey, 1974. pp.35-47.

Kash, D. E., M. D. Devine, J. B. Freim, M. W. Gilliland, R. W. Rycroft, and T. J. Wilbanks. Our Energy Future. University of Oklahoma Press, Norman, Oklahoma, 1976.

Linton, R. W., P. Williams, C. A. Evans, and D. F. S. Natusch. Determination of the Surface Predominance of Toxic Elements in Airborne Particles by Ion Microprobe Mass Spectrometry and Auger Electron Spectrometry. Anal. Chem., 49(11):1514-1520, 1977.

McBride, J. P., R. E. Moore, J. P. Witherspoon, and R. E. Blanco. Radiological Impact of Airborne Effluents of Coal and Nuclear Plants. Science, 202:1045, 1978.

Nichols, D. G., E. J. Rolinski, R. A. Servais, L. Theodore, and A. J. Buonicore, eds. Energy and the Environment, Proceedings of the Fifth National Conference, Cincinnati, Ohio, October 31-November 3, 1977. AIChE, Dayton, Ohio, 1978.

Ondov, J. M., W. H. Zoller, I. Olmez, et al. Elemental Concentrations in the National Bureau of Standards' Environmental Coal and Fly Ash Standard Reference Materials. Anal. Chem., 47(7):1102-1109, 1975.

Reiquam, H., N. Dee, and P. Choi. Assessing Cross Media Impacts. Environ. Sci. Technol., 9(2):118-120, 1975.

Schwieger, R. G. Utilities, Industry Burn Refuse to Generate Power. Power, 119(2):15-23, 1975.

Stryker, S. Interagency Energy/Environment R&D Program. Environmental Protection Agency, Office of Research and Development, 1977.

Stryker, S., et al. Interagency Energy/Environment R&D Program, Status Report III. EPA, Office of Research and Development, 1977.

Thompson, W. E., and J. W. Harrison. Survey of Projects Concerning Conventional Combustion Environmental Assessments. EPA 600/7-78-139, Research Triangle Institute, Research Triangle Park, North Carolina, 1978.

U.S. Comptroller General. Sixteen (16) Air and Water Pollution Issues Facing the Nation. 3 Volumes. Washington, D.C., 1978.

U.S. Dept. of Energy. Fossil Power Systems R&D. G.P.O., Washington, D.C., 1978.

U.S. Environmental Protection Agency. EPA Activities Under the Resource Conservation and Recovery Act of 1976, Annual Report to the President and the Congress, Fiscal Year 1977. Washington, D.C., 1978.

U.S. Environmental Protection Agency, et al. Second National Conference on the Interagency Energy/Environment R&D Program, Washington, D.C., 1977. Abstracts.

U.S. Environmental Protection Agency, Office of Research and Development. Research Highlights 1977. Washington, D.C., 1977.

Walker, P. L. Jr., N. C. Gardner, P. H. Given, H. J. Gluskoter, and J. L. Johnson. Catalysis of Coal Conversion Processes and Characterization of Mineral Matter and Trace Elements in Coal. EPRI-207-0-0. In: Research and Development Programs for Catalysis in Coal Conversion Processes. Electric Power Research Institute, 1974. pp. A86-A169.

Whittenberger, J. L. Health Research Needs and Energy Development. NP--20692, Harvard, 1976.